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THE HADHRAMAUT: PRESENT AND FUTURE

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I CONFESS that I have not found it easy to plan what shape this paper should take. I would rather have been able to give you a straightforward account of a single pioneering journey, and if when my wife and I returned to the Hadhramaut on 16 November 1936 things had gone as we had expected, I should have hoped to tell you about a journey made in the time-honoured way by camel from the Hadhramaut eastwards through the Mahra country to the sea beyond Cape Fartak. We left Aden for Mukalla with six weeks allotted us and had hoped to make the journey when the immediate tasks arising out of our previous journey in 1934 had been completed. But our destiny was written otherwise, and though the six weeks spun out into months and though we have now become permanent residents of the Hadhramaut we have not yet found the time or opportunity for our journey. So it happens that I am unable to give you all those fresh first impressions of a new country once visited which are so interesting to those who have to do their travelling as listeners or readers.

It may none the less be interesting to attempt a fuller perspective of the Hadhramaut by describing, with that knowledge which comes from day-to-day familiarity, a country which is still little known from many points of view; and I shall hope, too, to describe occasional excursions over its hitherto unvisited districts.

When I look back over these past eighteen months I am struck by the great contrasts between the Hadhramaut then and now, contrasts which are probably more marked than any other changes the country has seen in its history. Eighteen months ago the Hadhramaut had, it is true, already become one of the better-known regions of Arabia. There had been quite a spate of writing and talking about it and within a short period it had seen quite a number of European visitors, comparatively speaking, for I suppose the total number of Europeans who had seen it since 1843, when Von Wrede went there, was twenty to thirty, of whom all except an odd half-dozen had been there since

1933. In these last eighteen months however, and particularly during the last winter, the number of visitors, official and otherwise, runs into over one hundred, in fact, into several hundreds if naval visitors and tourists on the coast are included, for Mukalla has recently had the fresh experience of seeing bus loads of tourists from steamers driving through its street.

The more frequent and more intensive incursion of European visitors is of course in itself a great contrast with the recent past, but I think that the contrast which most strikes visitors who have returned to the country in the past year is the comparatively peaceful conditions which now prevail. Little more than a year ago every Badawin and tribesman in the country carried his rifle with him, even to walk across the street. Blood feuds were widespread, and even harmless travellers of the unarmed classes were at times likely to lose not only their property but their lives. Travellers by motor car had to take with them an escort when passing from village to village. In places there were extensive systems of trenches to pass from the villages to the fields, and I know of people who have spent as much as twenty years without getting beyond their own doors.

Now however all this has passed and it is comparatively rarely that you see a tribesman carrying a rifle, indeed many of them do not even carry the *jambiyas* or curved daggers which are almost as much a part of their dress as a walking-stick was of ours. How all this has come to pass is more a matter of the history of the Hadhramaut than its geography, but I should simply like to say that it was largely through the will of the people who have a genuine desire for peace and for the following of peaceful pursuits.

This new peace has resulted in a much greater contact between tribes and between different parts of the country and has made possible a great extension in communications. Eighteen months ago there were about half a dozen motors on the coast and about sixty in the interior, carried up by camels. By the completion of the Al Kaf road Tarim has been linked with Shihr and passenger-carrying lorries ply almost daily between the coast and the interior. When I left the country a couple of months ago there were at least two hundred motor vehicles in it and every ship was bringing one or two. Many more car tracks have been made and cars now go to almost all parts of the Hadhramaut, westwards to Al 'Abr and eastwards to As Som as well as up or down branch wadis. The Mukalla Government is also constructing another remarkably good motor road to the Hadhramaut which is being built northwards from Mukalla and southwards from Du'an. Something over 20 miles of the former and 10 of the latter had been completed when I left; about 60 miles remains to be done, of which the greater part is over the flat *jols* and offers no particular difficulties of construction. Starting from Mukalla you can now motor at least 300 miles in the Hadhramaut without recrossing your tracks, and there are over 500 miles of tracks altogether.

The possibilities of air transport have also been greatly improved. There were, eighteen months ago, eight landing-grounds in the five Sultanates in the eastern part of the Protectorate of which only three, Mukalla, Shibam, and Qishn, were used at all frequently. New landing-grounds have been constructed at Tarim, Seiyun, Hureidha, Al 'Abr, 'Azzan, Balhaf, Risib,

Haswein, and Heila, entirely by the people themselves, and most of the seventeen landing-grounds in the country are now in frequent use by the Royal Air Force. It is interesting to note that many of these landing-grounds were built on the initiative of the local people, and all the new ones were voluntarily constructed by them at no expense to Government. The Sei'ar, the Badawin 'Awamir in the north and one or two others have asked for landing-grounds to be made so that they may be visited.

Hitherto communication with the Hadhramaut has been by irregular calls of ships at Mukalla and Shihr, but now there is a weekly commercial air service maintained by Arabian Airways from Aden to Mukalla and Seiyun. There was previously no postal service but now there is a post office at Mukalla and five postal agencies at the principal centres of Shihr, Tarim, Seiyun, Shibam and Du'an. There was no wireless communication, but now there is a commercial service with Mukalla and Government stations at Seiyun and Al 'Abr, and another in contemplation.

Remarkable as these improvements in communication are they do not yet fulfil all the needs of the country, for it is over 60,000 square miles in extent with a population of only about 300,000, of whom perhaps 50,000 dwell on the coastal area and 100,000 in the comparatively fertile wadi lands of the interior, while the rest are Badawin or scattered in more remote settlements where the soil allows the production of a modest living. This wide area, rather larger than England and Wales, has now been all seen, at any rate from the air, though of course not all has been visited on the ground and there are still wide and very desolate areas which have yet to be trodden.

The areas that offer most scope for development and on the development of which the prosperity of the whole country must depend are, of course, the coast and the Wadi Hadhramaut system itself. As in all tropical countries agriculture must be the basis of the modest natural wealth of the country, and the area that offers most scope is the Wadi Hadhramaut and its dependent wadis, principally that part of the wadi between Henin and Qa'udha on the west and As Som on the east, with the Wadis Du'an and Leisar, 'Amd, Bin 'Ali, Al 'Ain, Tarba, and 'Adim, running into it from the south. Generally speaking little cultivation is attempted in the wadis from the north.

The outlook of the coast, dominated by Mukalla and Shihr, is chiefly commercial and maritime. Those who do not depend on trade go down to the sea either in the dhows or as fishermen, though there is a certain amount of agriculture and the most important areas are Meifa and Ghail Ba Wazir. From the development point of view the Hadhramaut is fortunate in possessing a balanced population and one that has shown itself enterprising in the making of money abroad. It is the general belief of responsible local opinion that many of the 100,000 Hadhramis who live abroad will return, now that there is security and the prospect of finding a living in a country which, more than many peoples with the emigrating habit, they always regard as home. In a balanced population there are classes which fit into every phase of the cultural and economic structure of society, and the obvious basis of development will do nothing to upset the existing structure but simply give it extended scope. In areas inhabited only by tribesmen development must be difficult and slow, for there are many occupations

in which tribesmen will not willingly engage, and as they are so conservative it will be long before they forsake their ancient occupation (or lack of occupation) and adjust themselves to fresh possibilities.

In the Hadhramaut however if the main producing area is to be the main wadi system, there is there a population which is already largely agriculturally minded. Shibam is chiefly a commercial centre, the principal market of the interior, but outside Shibam and throughout the other towns of the wadi the atmosphere is rural and people are largely land owners or workers on the land. In addition the tribes have become settled and it is interesting to note that most of them have settled in *badu* sections. Those tribes living in the great wadi are settled, but they have relations in the barren areas who are Badawin. If it becomes possible not only to make the country more self-supporting as regards its own food supplies, but also to produce something for export, it will benefit not only the growers but also the Badawin living between the coast and the wadi, for at present they have to take their camels back to the coast unloaded, since the Hadhramaut only consumes. Recently we forwarded samples of cotton and castor oil seed, which grow practically wild in the Hadhramaut without irrigation, to the Imperial Institute for examination and the reports were most favourable. This is not to say, of course, that their cultivation can be profitably undertaken without much further investigation and some experiments, but they are two possible lines of development, and now that an Agricultural Officer is being appointed new crops for systematic cultivation may be found. Water is of course the chief need, but that also we hope to investigate and there is every indication that there should be plenty of it in the areas most fit for agricultural development.

Mukalla is the political and commercial capital of the whole country. Here the Qu'aiti Sultan lives, and it is the headquarters of the Mukalla Government, and my own headquarters as Resident Adviser to His Highness and as the officer responsible to the Governor of the Aden Protectorate for political relations with the five easternmost Sultanates of the Protectorate. Mukalla is the one place that most of the several hundreds of visitors have seen. It is the most important port on the south coast of Arabia between Aden and Muscat, but somehow does not yet seem to have left the category of places which travellers take for granted, perhaps because until my wife and I took up our abode there had never been permanent European residents. In the last few months the European residents have risen to six, and though the place looks very much the same to us as it has always done, visitors say it is changing. A ship's captain who landed a short time ago asked in the bazaar how it was that port facilities had improved and how it was that the town looked cleaner. I believe the most enduring memory of Mukalla to people who have landed has been the stupendous fly population and the smells of dried fish and other even less pleasant substances. I would not go so far as to say that the flies and the smells have disappeared, but a recently trained local sanitary inspector with a corps of sweepers and sanitary dustbins have made some difference.

The climate of Mukalla is on the whole pleasant enough, and with the gradual cleaning up of the town healthy enough. Steps are now being taken to cope with the mosquito nuisance, for last year we had a particularly bad

epidemic of malaria, the sequel to the heaviest rains the country had had, according to the old inhabitants, for twenty-two years. It was astonishing to see after a few hours of heavy rain how much damage had been done, for rocks and debris were washed down from the cliff behind the town and the main bazaar street cut across in many places by torrents.

Like every seaport Mukalla is thoroughly cosmopolitan and you find in its bazaars representatives of Arabs from all the coastal parts of South Arabia and the Red Sea and Persian Gulf, as well as Somalis and other Africans. One curious strain of not infrequent visitors are long-bearded Mongolian pilgrims who flourish incomprehensible Chinese passports at me and, speaking no Arabic or other language which can be understood locally, apparently desire onward travel facilities. There are quite a number of Indian visitors and residents too, including Banian shopkeepers, and in the upper layer of Mukalla society the various races, Indian and Arab, mix quite happily. We all attend each other's parties and the Government servants of Mukalla have started a very good club. Amongst the various festive occasions of the last year or so none was greater of course than the Coronation celebrations. The streets and house-tops were gay with flags and I can remember no more beautiful sight than the illuminations at night. The Palace, the Residency, the Government offices and the principal mosques were outlined in coloured lights, and I should think Mukalla that night burnt almost as much incense as Pliny complains of Nero burning at the funeral of Poppaea. Almost every house that had not coloured lights heaped incense in piles along its roof parapets and the coloured lights and the flaming incense were wonderfully reflected on the waters of the harbour, while clouds of smoke filled the streets with a sweet-scented fog and completely obliterated the smell of the fish. Now of course Mukalla is every night reflected in the water, for electric light has been introduced and the greenish glow of the new street lights is visible far away. At the Sultan's request steps are being taken to reorganize and train his forces and to raise and train forces for the Kathiri Sultan, and thanks to Captain Hopkins who has been in Mukalla for nearly six months the standard is already much higher than formerly.

After four until sunset Mukalla walks abroad, sitting either in the cafés on the water front or wandering out through the western gate and sitting in groups above the camel park and the road which leads to the interior. This is the familiar road which has been trodden and described by most of the older generation of travellers, but I suppose that few Europeans in future are likely to follow it on camel or donkey as we did on our first visit three years ago, for I hope it will not be long before the new motor road is finished. The 20 miles or so which are now completed are really a remarkable achievement, for the road is a mountain road, skilfully built up with stone along the hill-sides and well above the torrent beds. The line was followed and mapped by Captain L. G. Beach, R.E., who in a short visit also fixed the latitude and longitude of Shibam and Tarim, but there has been no expert supervision and the builders, all men from Mukalla, have shown themselves extraordinarily skilful.

Nowadays most travellers for the interior go by car, either along the beach to Shihr or, if the beach is not open, along the inland road which

passes Gheil Ba Wazir, a well-built walled town and the headquarters of the Hamumi tobacco-growing industry. The most skilful diggers of wells and irrigation channels and tunnels come from this place and the system of water which irrigates the tobacco plantations is extremely thorough.

Shihr is an ancient town. Its present walls are not old but there has been a town on this site for at least eight hundred or nine hundred years, and the principal coastal town of the neighbourhood has been hereabouts for a great deal longer. Mukalla of course is much newer. Shihr is an important fishing centre and vast quantities of fish are brought in daily to be sun dried for up-country consumption or eaten fresh locally. Weaving, dyeing, and mat making are minor but locally important industries. About 7 miles from Shihr is Tubala which has been built on a hill over sulphurous springs. This place has won local renown for its sulphur baths and quite a number of rheumatic sufferers have visited it. Hami, farther along the coast, has an even larger number of hot springs, but the picturesque site of Tubala suggests the possibility of a Spa hotel, easily accessible by car from Shihr, and we have rather prematurely considered the positions of the Pump Room and Concert Hall in the Spa Gardens. In view of the progressive ideas of His Highness and the Seiyids in the interior, the provision of a few hotels is not an unlikely development before long, and the country will be an ideal winter resort. Shihr is the principal market for the whole of the eastern Hadhramaut, including all the Kathiri country, and its imports by sea are very considerable, although it is worse off for harbour facilities than Mukalla, as it is nothing but an open roadstead and has no jetties; but apart from the local Aden steamers even ocean-going steamers call there as well as at Mukalla.

Most of the carrying trade is in the hands of the great Hamumi tribe, which has no real villages of its own and extremely few dwelling-houses, but which owns a very large number of camels. The chief of the tribe also owns a great quantity of date palms in different parts of the Hamumi country. I have recently done a considerable amount of flying over Hamumi country which extends over about 3000 square miles and is now well known to the Royal Air Force.

When we first went up the road to Tarim in November 1936 the car road was of course not completed and some 20 miles northwards from Shihr there was a gap which had to be traversed by donkey through Ma'adi, the country of the Ba Hasan Tanbulis who had steadfastly resisted the attempts of Seiyid Bubekr and the Al Kaf family to complete it. These Ba Hasan Tanbulis are allied to the Hamumis and are nicknamed Tanbuli because they are the only people in the whole of the Protectorate who grow betel nut and pepper vine, though Ibn Batuta speaks of it at Dhufar a good deal to the east, and I expect it exists there still. There is nothing much in the countenances of the Ba Hasanis to make you think they are related to the Hamumis, for as a whole the Hamumis are fine-looking men and uncouth is a mild word to describe the general run of Ba Hasanis. Hamumis themselves have said to me that they are not human beings, and an Arab friend, when we were looking at some of the more primitive of them, said to me: "They only want tails and you would say they are monkeys." However they grow on you as I daresay monkeys do after a time, and I am now quite fond of them. When

we first went up there they charged us two dollars for every skin of water we took and a dollar for four coconuts, which we were reduced to buying as we had no other food and were stuck for a couple of days waiting for cars from the Hadhramaut. On that first visit one very nearly shot me for trying to take his photograph, but now he is more than ready to pose. During the two nights we were waiting for cars the Ba Hasanis were a little nervous as they had murdered some one shortly before and were expecting an attack, so we had to build rough stone forts. When we had lent a hand we suggested that we should be paid for our labour as they had charged us for everything, but they did not like the idea and spent the night on sentry go droning monotonously to keep themselves awake. One good lady of the Ba Hasanis dresses as a man with dagger and all, and likes to be called Sheikh Salim. She is the only one of the women who does not veil. The habit of veiling varies a lot through the different tribes of the Hadhramaut and quite a number of them go uncovered.

When the peace was established it became possible to complete the Al Kaf road and it was opened by Sir Bernard Reilly in July last. It is now a toll road administered by a Board and half its revenue is being accumulated for capital works and improvements and half is being spent on maintenance. The maintenance expenditure is becoming very heavy as the daily buses do a lot of damage. The fees for the use of the road are designed not only to give revenue but also in conjunction with minimum fares to protect the Badawin camel traffic. Indeed goods are not allowed to be carried by road unless they are perishable, too heavy for camels, or urgent, in all of which cases the freight charged has to be higher than that which would be charged for camel transport.

It is about nine and a half to ten hours' solid driving from Shihr to Tarim, though of course one usually stops for a meal and that makes it about twelve hours. After leaving Ma'adi the road runs along the well-named Jol al Fiqra or Backboned Plateau, a ridge from which magnificent views to the sea 20 to 30 miles away and over deep wadis are obtained. After that the scenery tends to become monotonous, particularly when you have done the drive a dozen times or more, as it dodges endlessly round flat topped hills and wadi heads, and after the '*aqaba* of Ma'adi the remaining 130 miles or so are a series of levels from which you climb or descend by quite modest hills. Two hours on from Ma'adi you come to Reidat al Ma'ara, the country of the Ma'ara tribe, a collection of small scattered villages in country intersected by shallow wadis which offer some chance of cultivation. There are some wells, but the people depend very largely on *qarifs*, open water-holes built to collect the rain-water. The Ma'ara, who are friendly folk, are also distantly related to the Hamumis. They never give any trouble though there are one or two of them who are terrific litigants, and are always coming to see me in Mukalla or the Hadhramaut about cases which I have had investigated by several independent tribunals with invariably the same result. Most of these squabbles are land squabbles and that is a source of the greater part of the litigation in the Hadhramaut.

Reida is the place where one generally stops for lunch, as it is very nearly half way. The pleasantest place I think is under a tree near one of the *qarifs*,

and here we stopped on our first journey up, dispossessing a large band of monkeys. This was the first time I had seen them so far east, though we have often seen them north of Aden. As a matter of fact, one rarely meets mammals apart from gazelles and foxes in the Hadhramaut, though lately I was offered a hyena pup in Tarim, and there are wolves, ibex, and oryx. Others prefer for lunch at Reida a house not far away, where if you give an order in advance you can obtain quite well-boiled rice and boiled meat. Our superior friends in the Hadhramaut have named the place Shepheards, principally I think because you are always overcharged there. The first time we passed through the village somebody asked my wife for medicine and was given Epsom Salts. Crowds then came out and stretched forth supplicating hands which were all filled and in this way a pound or two was distributed, but there has never been any ill-feeling about it and relations with the tribe have been uniformly friendly. They have a large tree which is known as the Sanctuary, and under it all the important tribal conferences are held. Here I sat with the elders on a subsequent visit and they signed the general Hadhramaut three-years' truce.

A little beyond Reida you pass into Kathiri territory belonging to the Al Jabir, and the road passes near Risib, where there is a landing-ground. The people of Risib have had a very bad reputation for caravan looting and holding up cars; indeed they fired on cars before ever we came into the country. They were punished for an offence of this nature and are now genuinely among our best friends. My wife and I have stayed with them at their invitation and they entertained us lavishly in their simple way. They told me that they had always believed themselves to be under the protection of the Sultan of Turkey; now their only request is to be helped to find water, and I very much hope that before long it will be possible to help them, as they depend entirely on rain-water and when their pools dry up they have to leave their homes and wander away with their stock elsewhere.

The last sign of permanent life on this road is a little beyond Risib at Heru, where there are a few Sheikhs who have some popular water-holes which last longer than most others on the road and are generally much surrounded with stock. It was a wonderful sight near Heru last year after the heavy rains to see the shallow wadi green from side to side, winding away in each direction apparently fully cultivated. The people never cease to talk of the blessing of peace through which they are able to cultivate far more than they were before, and those heavy rains are universally attributed to the mercy of God manifested as a reward for the peace.

From Heru to Tarim takes four hours and the road is absolutely desolate. Caravans follow a wadi route into the Wadi 'Adim where there is water, for there is not a drop to be had on the route that the cars have to follow, and of course it is usually on this part of the road that one has breakdowns.

I arrived at Tarim at 8.15 in the morning. The '*aqaba* leading down to Tarim is one of the most remarkable engineering constructions in the world. People who know say that no European engineer would attempt it. It consists principally of hairpin bends which you have to reverse to get round, and parts of it have gradients of about 1 in 3 or 4. If you fire a rifle at the top of the '*aqaba* it lets Tarim know you are coming and the whole place troops

out to meet you. Many people prefer to walk down the *'aqaba*, and in any case the drivers stop at the top to tie up the brakes. I have only walked down once, and that was on the morning of the New Year. I sat for a short time at the top and it really was a most beautiful sight watching the day break over the minarets and white houses of Tarim.

"Tarim and thou desirest no more" is a local saying, and in truth I know of no happier places to live in than Tarim and Seiyun. I shall never forget our first impressions of Tarim nor I think does anybody else forget his, but the charm of these places grows with knowledge and they have a hospitable and cultured society. There is little literary learning in Mukalla or Shihr: Mukalla can be difficult to live in, but Shihr is always friendly and welcoming. Seiyun and Tarim are not only that, but can talk of affairs, of history, and of philosophy. The whole country is full of poets, and not only quotes the old poets but records constantly current history in *qasidas*, and that is how much of it survives. At a Shabwani dance the poets assemble and in turn compose extempore couplets, which are repeated by the choir leaders and taken up by a hundred throats.

Tarim and its rich suburb of 'Aidid, where there are several beautiful Riviera villas, are of course under Kathiri rule, but they and the small village of Al Ghuraf are in Tamimi country. One interesting fact about Tarim that I have learnt recently is that it contains a state within its walls. This enclosure, which contains a few houses inhabited by the Seiyids of Al Haddad, is ruled by their *mansab* under some ancient right. His subjects are completely under his jurisdiction, and even if they commit offences in the city of Tarim are not tried by the Sultan but handed over to him. The intelligentsia of Tarim call him the *Baba* (the Pope) and his state the *Fatikana*. Tarim and Seiyun both have old religious academies (*Rubats*) to which students come from considerable distances in the west of the Protectorate and from the Yemen. I remember when I first passed the Tarim Rubat a long time ago there was a rush to exclude the contaminating influence, and all the doors and window shutters were hastily banged. Life gets more pleasant when crowds of children and adult hangers on cease to follow you shouting *Nasrani* (Christian). When I returned to Mukalla from the interior in March 1937 one small boy did shout Nasrani, but was immediately corrected by a friend who said "*That's* not a Nasrani, that's Ingrams."

The Tamimis, who stretch several miles on the way to Seiyun, and down the Wadi Maseila to below Qasm, the Tamimi capital, are a Qu'aiti tribe, so that Tarim and Al Ghuraf form islands in their territory. There are no Badu sections to the Tamimis, and they all live in the wadi and emigrate largely to East Africa and the East Indies. They are however an astonishingly disunited tribe whose sections were constantly warring against each other, mostly over land questions. In this way they are a great contrast to their neighbours, the Manahil, who belong to the same Confederation, the Beni Dhanna. The Manahil are all Badus but are completely united in following their young chief 'Aidha bin Tannaf, a very fine lad of about twenty-five. I thought at first that the Manahil were not going to join in the truce, but after holding back for a little while they came and signed, and have never caused the slightest trouble, though 'Aidha had considerable difficulty in restraining

them from retaliation on the Sei'ar, the traditional enemies of most of the Hadhramaut.

The men of the Manahil, Mahra, and those distant sections of the Kathiri who live up amongst the Mahra on the confines of the desert, take their mothers' names and not their fathers. Ordinarily of course Arabs call themselves Hassan bin Muhammad for example, but these people say Hassan bin Maryam. The Manahil and the Hamumi and some of the other tribes are almost exclusively monogamous and the women, who in some parts are not veiled, are extraordinarily free. A man proposes marriage to the woman direct, and her father will say it is not his concern. Bride price is very high, but the bride brings a lot of stock with her.

I have not journeyed far down the Wadi Maseila on the ground during the last tour, though I had been invited to attend the pilgrimage to the tomb of the Prophet Hud. However as I had not the time to go Seiyid Bubekr took me on the first aerial pilgrimage, as he called it, and the beautiful tomb in its picturesque surroundings crowded with a record pilgrimage presented a great contrast to the last time my wife and I had seen it, out of season when we were travelling down the wadi to Seihut. I noticed on this occasion the ruins of an ancient town on the very edge of the *jol* above 'Einat, and I think these are about the only ruins there are in such a situation in the Hadhramaut.

There is perhaps no need to say more of the big towns of the wadi, Tarim, Seiyun, and Shibam, or of the fertile lands between them now happily all at peace. The famous trench system of Al Ghurfa is now disused and the town is open to traffic, so that cars no longer have to skirt perilously round its walls. The whole place has been green with crops, a record millet crop last year and a record barley crop which was being harvested when I left in April.

Seiyun has changed in some ways, for like Tarim it has a new landing-ground used not only by the Royal Air Force but by civil machines, and in the town itself I have an office—for I am also Resident Adviser to the Kathiri Sultan—and there is a newly uniformed body called the Kathiri Armed Constabulary recruited mainly from the Sultan's slaves. I think it is generally known now that these so-called slaves are in fact much more independent than many free men, but it may not be so well known that with the full agreement and co-operation of the Sultans steps have been taken to grant freedom to any slave who desires it. The camel park has been moved from beneath the palace and there preparations are being made to lay out a small garden surrounded by the arcade in which are the police station, the post office, and a small dispensary.

Seiyid Bubekr's house which was being built when we first visited Seiyun three years ago is now finished. Its architecture is, I think I may say, not approved of by Miss Stark, as she no doubt will tell you, but it is a remarkably comfortable house, and when the family is living there a very happy house to stay in; but for some months Seiyid Bubekr's family has preferred to live in another big house of the old-fashioned kind in the town. Living in the empty Dar es Salaam, as it is called, gave me so much the feeling that my wife and I once had when we spent a day or two as the only guests in an enormous hotel in Belgium out of season that I prefer to live in the other house with Seiyid Bubekr. Many are the people who have enjoyed his kindly

hospitality in the new house during the past year, and last hot weather nothing was more delightful than to sit in the swimming pool in the evening and listen to the strains of the B.B.C. Empire Orchestra. Since then the Arabic broadcasts have started and they are extremely popular throughout the Hadhramaut, which now sets its watches by Big Ben. Bathing over, dinner would be laid on carpets by the side of the bathing pool. One rarely sits down less than twenty at meals in Seiyid Bubekr's house and very often it is forty. The average daily consumption runs into about 30 to 40 lb. of rice, three or four dozen eggs, half a dozen chickens, and one or two sheep, and several pounds of vegetables. We went up for the wedding of his daughter, and then over five thousand people were fed for three days.

Seiyun has been our principal headquarters in the wadi, and from it I have continually visited all the neighbouring places, staying at Shibam, Al Qatn, Henin, Qa'udha, and Hureidha. You never get to Hureidha without stopping for a meal at Diyar al Buqri, where the people are so hospitable that they have been known to fire on those who have attempted to pass in cars without stopping to have a meal. The Buqri are Nahd, and although they are settled they are still rather Badu. On my first visit they offered us a large house if we would but stay and rule the country, and it was then I learned that they had imported a first-class cook from Java in the hope of being able to entertain Europeans. Great as is the hospitality and kindness of all the Nahd, the meals at Diyar al Buqri are as fine and as varied as anything you could get anywhere. Their ideas even of afternoon tea are on the most lavish scale. I have had it with them three times and on each occasion they have produced cakes, honey, and halwa, several varieties of tinned fruit, British biscuits, and super-cream toffees.

Beyond Diyar al Buqri, as you enter the Wadi 'Amd, stands a little fort with a sentry for ever gazing out. It was some time before I discovered that the sentry was a dummy, a lump of clay artistically draped with a black cloth, but in recent months I notice he has fallen into disrepair. The Nahd extend down into the Wadi 'Amd almost as far as Hureidha, of which the population consists entirely of Seiyids of the Al 'Attas family and their dependants. Here, too, I have several times stayed, and there is now a landing-ground. There is no need for me to say much about Hureidha as it is here that Miss Stark, Miss Caton-Thompson and Miss Gardner have been wintering. One interesting fact about Hureidha may however be too trivial for their notice, and that is that one of the mosques has two large town clocks, one with a face 6 feet in diameter and the other 3 feet. Only the latter works, and they are of course at the top of the high minaret. But they are inside the minaret, and you have to walk up sixty or seventy steps to see the time.

Up the wadi from Hureidha is the Ja'da tribe. I have not travelled farther up the wadi than Hureidha on foot, but before I went there for peace negotiations my wife did the journey on camel. The wadi is thickly populated and has numerous small villages which at that time were nearly all at war with each other. My wife took down particulars of thirty-two major feuds going on between sections and even between houses a few yards apart. There were trench systems, similar to those at Qa'udha, leading from the houses to the fields, but owing to the disturbed conditions cultivation had suffered badly

and there was a general desire for peace in order to get on with the work in the fields.

My wife was accompanied by Seiyid 'Alawi al 'Attas and Jemila, a devoted maid servant of the family, who perched precariously on the back of my wife's camel singing Badawin war songs. My wife learnt some of them and they proceeded up the wadi singing duets. Besides being an amusing companion Jemila was a very useful one, for she proved an excellent lady's maid and a masseuse as well. Seiyid 'Alawi has married a tribeswoman, so the party stayed at Zeila in the house of his brother-in-law, one of the principal Ja'da chiefs. Like many Ja'dis their host had been to Java, but the only sign of his travels was a bicycle which he had brought back with him and which he said he preferred to a camel. From Zeila they rode through many small villages to 'Anaq belonging to the Al ash Shaibi, who are credited with possessing the Evil Eye and consequently shunned as much as possible. Seiyid 'Alawi thought it prudent not to mount his camel till the village had been left well behind, in case he was made to fall off by some evilly disposed person. They spent a night at 'Amd, which is almost at the end of Ja'da territory, for a little farther up the wadi the Madhi tribe have their habitat. All the villages in the wadi are much alike with a few three- and four-storeyed houses set amongst smaller ones, and most of them have well-built tanks for catching rain-water. Particularly in the left bank there are many dug-out caves, largely used now for habitation and grain stores. Miss Caton-Thompson says that these were probably all Himyaritic tombs. I think some cave dwellers she met were rather put out when she told them they were living in tombs. Many of the Al 'Attas family, who have much influence over the Ja'dis, have been canonized and their domed tombs are objects of veneration in several villages. My wife's appearance was taken for granted at 'Amd, where she spent a night with women who had been to Java and had seen European women before. They had brought back a few momentos of their travels and impelled by the same spirit that makes us hang Eastern curios on our walls they had hung up a pair of cheap European high-heeled slippers for the admiration of their untravelled friends.

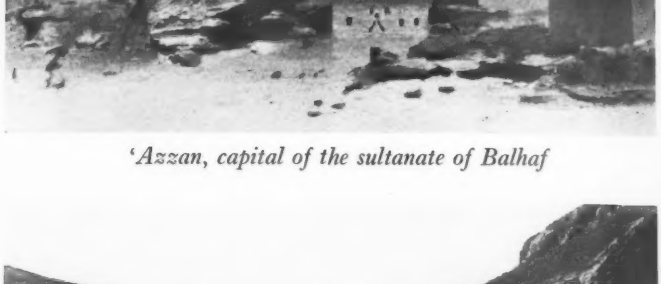
From 'Amd they returned down the wadi following the left bank and passed many ruins, most of which covered low spurs jutting out from the cliffs. At Husn Ba Qasm there are ruins known as 'Adiya Qudha'a which may indicate the site of what was once the principal town in the wadi, as in the days before Islam it was called Wadi Qudha'a. Near the large village of Batch they passed the time of day with a man who spoke to them from a second-storey window of his house as he dared not go out, for he was carrying on single-handed a war with all his neighbours. Like many others with whom my wife talked he asked for peace. Another had said "We want peace, we're sick of fighting. A man works in his fields and is shot dead—what's the use of it?" And another stopped them and said: "A country without a government is not a country. Bring us peace and settled government."

Returning to Shibam, which is of course the principal Qu'aiti town of the interior, there is west of it past Al Qatn and as far as the junction of the Wadi Du'an a bloc of Yafa'is, with a few Kathiris surviving in such places as Ajlania on the junction itself and also in the Wadi 'Amd. These Yafa'is have been

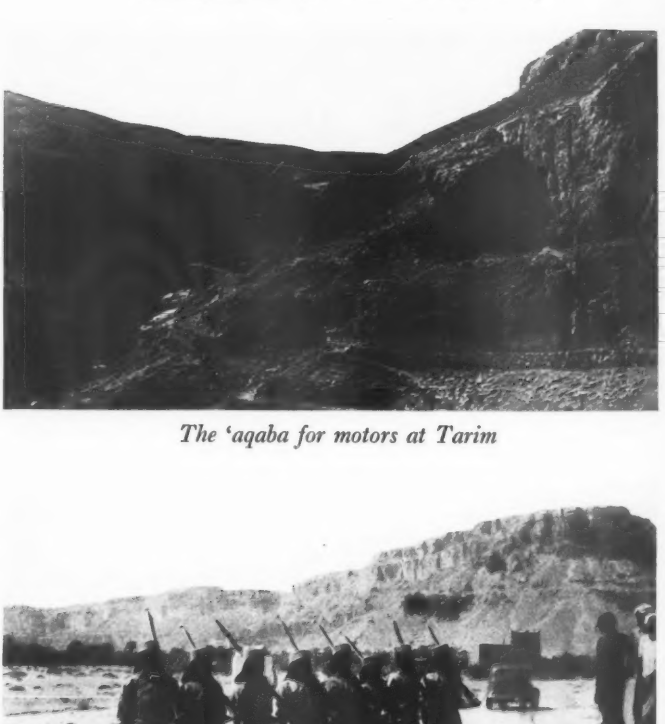
Armoured car near Al Ghurfa

Trenches at Al Ghurfa

'Azzan, capital of the sultanate of Balhaf



The 'aqaba for motors at Tarim



The Kathiri Armed Constabulary

settled here for several centuries, for as far back as the beginning of the sixteenth century Bedr Bu Tuweirak, the well-known Sultan of the Kathiris, whose chain armour and shield has recently been found by the Kathiri Sultan in the palace at Seiyun, imported Yafa'is together with Zeidis from the Yemen and Turks as mercenaries. In course of time the Qu'aiti dynasty arose from these mercenaries and became the principal power in the country. So long have they been settled here that they are now genuine Hadhramis, and like the rest of the Hadhrami tribes are strongly in favour of the present peaceful arrangements. These settled Yafa'is are known as Thelud to distinguish them from the Gharib, the foreign Yafa'is, who still come from the Yafa' mountains in the western part of the Protectorate and serve a while as soldiers. It is among these latter Yafa'is that those who oppose the peace are found, for they are great usurers and have for long made a living from oppression of the poorer classes; and they realize that with the establishment of good order and justice they will not have the same chances in the future.

Al Qatn is about the farthest west that there is extensive cultivation, and it was a marvellous sight last May to see the whole width of the wide wadi green from side to side. Beyond the Yafa'is westward are the Nahd who extend practically to Al 'Abr. They live entirely in the wadi and in the eastern part of their territory are settled; and in the western, where there is little but sand, are Badus keeping flocks. Their capital is Qa'udha where lives Hakim Mbaruk, the very fine old chief with a wide and enviable reputation for dispensing real justice. The Nahd are a well-built tribe and the elders, of whom there are many, have enormous bellies and resonant voices. From the Nahd we have recruited fine young men for the Qu'aiti Sultan's new camel-lancer bodyguard, and very well they look in their scarlet and blue uniforms. I shall never forget the day when the Nahd signed the peace treaty. They had lived in trenches and imprisoned in their houses for years and they all came out at once and there were many reunions.

North of the Nahd in the steppes between the wadi and the Rub' al Khali is the country of the Sei'ar tribe. We travelled into their territory in 1934 and at the beginning of 1937 when I was travelling round obtaining signatories to the peace treaty, practically every Hadhramaut tribe, asking who had signed and with whom they would be able to consider themselves at peace, ended up by asking "And the Sei'ar?" I do not think there was a single tribe in the Hadhramaut among whom the Sei'ar had not looted or killed, and their reputation is generally bad throughout Southern Arabia, for they are cowardly folk and are fonder of stealing by night and murdering by treachery than by taking and killing in fair fight. Some of the Sei'ar signed the truce straight away, but others later on in the year looted over forty camels from the Manahil, and public opinion demanded that something should be done about it. Arising out of this matter the whole of the Sei'ar country was explored from the air and by this means we were able in three or four reconnaissances to discover the lay-out of their country and incidentally to examine the northern limit of the steppe and the desert.

I accompanied all these reconnaissances, of which the first were made in October last year. So that we might have something we knew to start with, we followed first of all the route which my wife and I had taken before. From

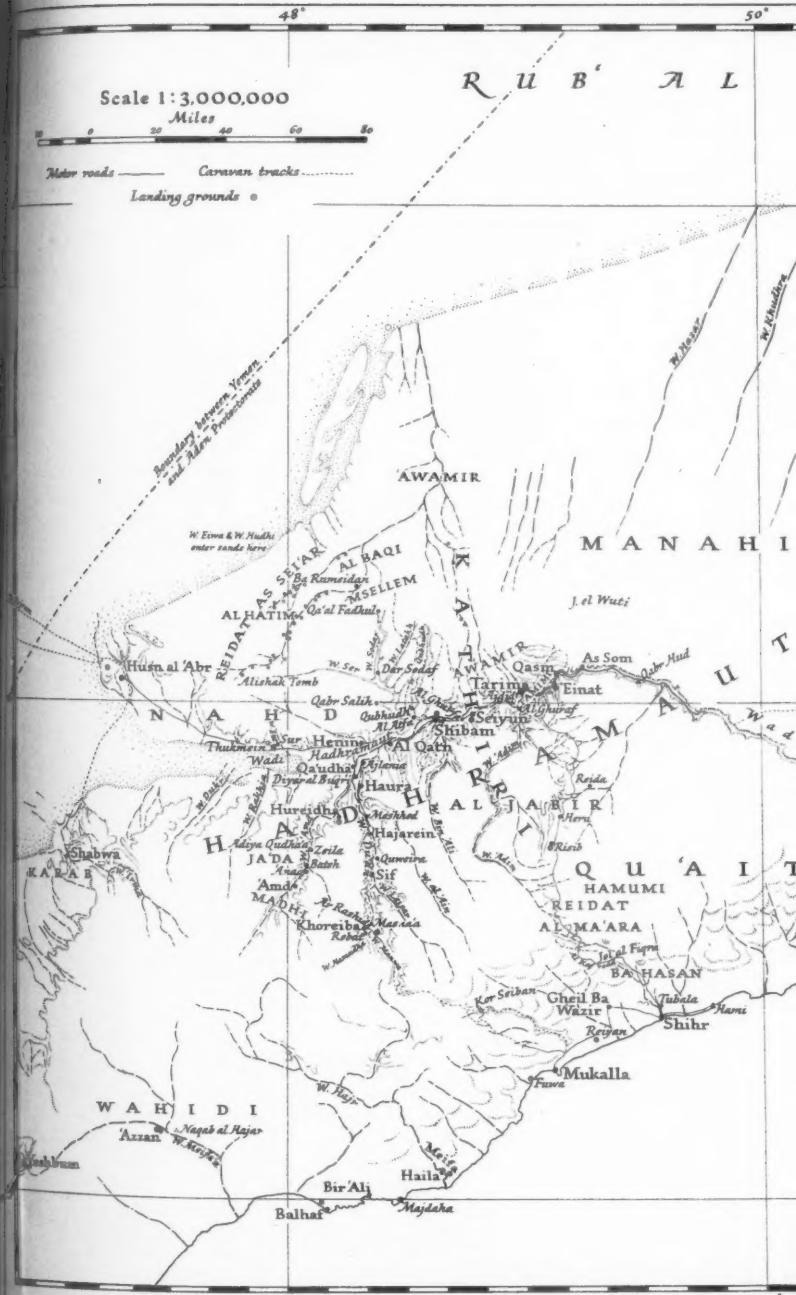
Shibam to the entrance of the Wadi Ser took us three minutes; this journey had taken us exactly two hours on camels, and twenty minutes by car. After sighting the tomb of the Prophet Salih in the Wadi Khonab we turned into the Wadi Ser and at the mouth of the Wadi Latakh I recognized the Bents' Himyaritic caravan signpost. Then we went up the Wadi Sodaf and from Qa' al Fadhul on the *jol* at its head took directions previously given to me by Badawins for Ba Rumeidan, which we found. This is the residence of Tannaf, the principal chief of the Al Baqi Msellem of the Sei'ar. From the air I saw plainly that just before Qa' al Fadhul we were over the northern watershed, from which deep-cut short wadis run south-south-west to the Hadhramaut, and long shallow ones in an east-north-easterly direction to the sands. There was very little habitation over this part of the country, and most of the inhabitants live in caves. After just over forty minutes' flying from Shibam we found ourselves between two short wadis running out into a broad channel of sand which it took us two minutes to cross, and beyond it was a broken mass of rock stretching away to the north-east. The channel itself ran out into the desert just west of the course of the flight, and the distance from Shibam to this point is calcuated at 69 miles. The visibility was perfect. Air Commodore McClaughry, who was with the flight, noted the high mass of the Seiban mountains at least 100 miles away to the south, so that one could also see at least that distance to the north. An unbroken sea of sand stretched wave on wave far away to the horizon. Looking north it was the most remarkable rosy red colour, quite unforgettable and quite unbelievable if an attempt were made to paint it. It was about three-quarters of an hour short of noon local time, so that the colour owed nothing to early morning light. After a few minutes over the desert, which seemed all too short, we came back to Shibam a bit to the west of Wadi Qubhudh.

Next morning we left Seiyun at a quarter to nine on an almost due northerly course. On this outward flight the same facts were observed, deep short ravines running nearly south to the Hadhramaut, and past the paler coloured *jols* of the watershed more shallow wadis running almost east-north-easterly to the sands. In the upper reaches of the southern system we saw a few poor settlements of the 'Awamir and a caravan of some fifty camels plodding its way southward. The whole *jol* from west to east is heavily scored with well-marked tracks, and it is worth noting, as I have also noted on aeroplane journeys over the Wadi Maseila, that east of our course and some 50 miles north of the wadi as it goes towards Qabr Hud there is a considerable rise in the ground, almost a range of mountains. This is probably the Jebel al Wuti of Von Wissmann's map.

After exactly an hour and a quarter's flying we passed over the edge of the steppe and the desert, just by a conspicuous large white patch of sand, the distance from Seiyun being calculated at 112 miles. Again there was the same wonderful sight of endless rosy waves of sand, though when we were directly over the sand I noticed that it was a rich ochre. Just west of the white patch a channel of desert sand opened into the steppe. This proved to be the eastern end of yesterday's channel, separating a long broken up island *jol* from the mainland. Its situation and shape were sufficiently like Madagascar for us to call it that, and the name seems to have stuck in local usage. The flight

EASTERN ADEN PRO

"THE HADHRAMAUT: PRESENT



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HADHRAMAUT
Ingrams

coasted westwards along the line just dividing the desert from the steppe; where the larger wadis run out into the sand there were wide stretches of scattered vegetation which made the land look as if there was a green scum on it.

At the western end of the "island," much broken with gulfs and with small islands lying off it in the desert, the flight turned to the south-west, a little to the west of the point which had been reached on the previous day's reconnaissance, and explored the western part of the Sei'ar country, the territory of the Al Hatim of which Bin Jerbu'a and Bin Mulhi are the chiefs. This is the heart of Reidat as Sei'ar, and turned out to be surprisingly thickly populated and cultivated. On almost every bank of the wadis were villages consisting of the usual type of Hadhrami Badawin conglomerate *dars*, with a tall tower in the centre, and small contiguous quarters, each called a *Beit*, clustered round it. Subsequent flights made this country very familiar, and with the aid of a Sei'ar, one of the most intelligent Badawin guides, I was able to identify almost all these *dars*. On several occasions we flew beyond Reidat as Sei'ar over uninhabited steppe to Husn Al 'Abr, seeing on clear days Shabwa away in the distance.

These reconnaissances seemed to us very interesting, not only politically but geographically, for the watershed and the fall of the land, steep towards the Hadhramaut and gradual towards the sands, were clearly visible. Up on this watershed I recorded altitudes of 3600, while 300 miles to the east Mr. Thomas states that the altitude remained fairly constant at about 950 feet. This northern steppe is bounded on three sides by sand and has cliff-walls all round it, highest on the wadi side and lowest on the northern or desert side. At a conservative estimate in some 20 square miles there are not less than fifty to sixty Sei'ar villages which have scarcely even been visited by Arabs other than the Sei'ar and the Al Ishaq Sheikhs who live among them.

Some time after these reconnaissances my wife and I visited Al 'Abr on the ground, though she in fact went rather farther and drove some 20 miles towards Shabwa, a day and a half's camel ride from Al 'Abr. We have thus seen the whole of the Wadi Hadhramaut from its source to the sea, and the more you see of it the more extraordinary it is, for it must be at least 40 miles from its northern or left to its southern or right banks at Al 'Abr. This of course narrows very rapidly to 4 miles or so at Henin. It was from Henin that Seiyid Bubekr and I set out for Al 'Abr, following for a start the tracks which Dr. Pike, on a geological survey, had made in that direction. The tracks made by Mr. Philby had of course disappeared.

Our object was to obtain the looted camels of the Manahils, held by the Al 'Abdulla bin 'Aun of the Sei'ar at Al 'Abr. We had with us the fifteen slave soldiers of the Qu'aiti Regular Army who were to be installed there as a garrison, and as we did not want the Al 'Abdulla bin 'Aun to abscond into the desert with the camels, we had kept our movements secret. Seiyid Bubekr said his sunset prayers at Henin. The lorries had gone ahead and had made very slow progress as they had had heavy sand to negotiate. It was difficult finding the way in the dark, but we caught them up at half-past eight, and all of us sat down to dine together, just near the village of Sur and under the two mountains called Thukmein which form a conspicuous landmark from the air for a radius of 70 or 80 miles around. This was 27 miles from Henin,

and we were in country with which there had been practically no contact. It must really have been alarming to the Badawin: a noisy party in lorries, which they had not seen before, and ourselves in cars, shouting directions to each other in the night and firing Verey lights to show each other the way; but the Badawin materialized out of the darkness, most surprisingly without rifles, directed us time and again on our way, and pushed our cars out of the sand.

After Thukmein, which we left about half-past eleven, we had no great difficulty in moving on as the moon was up. We drove on for some hours and then stopped to let the rest of the party come up. It was bitterly cold and the keen wind cut through us as we huddled together trying to sleep on the sand, but we did sleep and woke to a marvellous dawn. The sunset of the night before, the brilliant moon, and the sunrise are three enduring memories of that night.

The four flat-topped hills of Al 'Abr lay about 10 miles ahead of us, and although only one of the lorries had come on, the other having had one of its many breakdowns, we decided to go on. It was marvellous hard sand on which a speed of fifty was easy and we had quickly left the lorry behind. We made our way into the wadi bed, myself acting as guide as I was the only one who knew the country even from the air. There were one or two Bureiki Sheikhs about with camels, and rather reluctantly they told us that the 'Abdulla bin 'Aun were also there with the camels. A few minutes' driving up the hard wadi brought us to the ruins of the fort, said by the Al 'Abdulla bin 'Aun to have been built by them.

The dozen or so Badawin round the well looked extremely surprised when the car drew up. I suppose they were hardly awake, as the morning was still chilly and they were all wearing their sheepskin coats. A few Bureiki Sheikhs came down and bade us welcome. All the rest of the Badawin claimed to belong to every tribe except the 'Abdulla bin 'Aun. Some said they were Sheikhs, some claimed to be Daham, a Yemeni tribe, and some Nahd, but there were a good many shifty looks and in the course of the morning we sorted out nine who had given themselves away and who finally admitted to belonging to this raiding section. There are only forty-three males all told of the 'Abdulla bin 'Aun, but from the amount of trouble they had given in the past it was well worth getting them under control. They have no houses or settled habitation and are about the only people of the Hadhramaut who have goatskin tents. They are part of the Al Hatim, but Bin Mulhi, their chief, says he has no control over them and the Sei'ar themselves were delighted when we took hostages from them and put in a garrison, whose function is to protect the travellers and not to interfere in other ways.

Presently the lorries came up and I installed the wireless and settled the garrison into temporary quarters. There was nothing at Al 'Abr except the ruined fort of which only one wall still stood, a small stone *murabba'a*, one of the dark cube-shaped shelters used by travellers all over the Hadhramaut, and a hut built of branches of trees and grass of which there was a great profusion. There was also a new *weli's* tomb decorated with ibex horns, and one of the Bureiki Sheikhs took us there and slapping the tomb addressed its lately canonized occupant and introduced us. We put the garrison into the

grass hut, as the *murabba'a* was occupied by a woman who had been bitten by a snake and the Sheikh asked us not to disturb her: it was part of her treatment that she should not be seen. A thin trail of ash had been sprinkled round the building to keep other snakes away.

During the day we collected other 'Abdulla bin 'Aun who came and watched us from a distance in little groups. Somehow they seemed to be fascinated by us, for although they would not come when we shouted to them, they made no attempt to move or to resist when we walked over to them and told them to come along with us. Few of them were armed, and neither were we until the garrison came along. There were a couple of wells in commission, and I was told that at one time there had been as many as eighty-one. Some of the Badawin showed us on the wall of a cliff little columns of holes bored in soft stone. You counted up the holes and then stepping that number of paces from the column found yourself on a buried well.

Having explored the neighbourhood of the fort we went to see the site for a landing-ground which had been previously decided on from the air. Unfortunately it had to be at some little distance from the fort—2 or 3 miles—but it was a marvellous landing-ground and greatly pleased the Royal Air Force when they came along later in the day and flew Seiyid Bubekr and myself back to Seiyun.

On later visits I had the opportunity of seeing all the surrounding country from the air, and I was struck by the truth of the saying that Al 'Abr is the "Key of the Hadhramaut," for behind the mountains tracks radiated out in all directions to Nejran, the Yemen, and Shabwa and the Western Aden Protectorate. From Al 'Abr eastwards there was only the one track. I have visited Al 'Abr five times on the ground and passed over it many times by air, and on each occasion I have been struck by the large number of caravans which halt there for water. For a week or two after our occupation there was some falling off, as the Badawin were not certain of our intentions, but now it seems that far more come than before; they have a sense of security which was previously lacking when the Al 'Abdulla bin 'Aun were constantly looting them. My own belief, which is shared by responsible opinion in the Hadhramaut, is that before long a town will spring up there, as it forms an ideal place for a market and there is plenty of good water. The wells are not much more than 20 feet deep, cut through the soft limestone, and as soon as you draw the water out it runs in again in such a way as to give you the impression that there must be an underground river. On the first visit I took there a party of skilled builders from Tarim and they set to work at once to rebuild the fort. They also opened another well or two, and if we can find the money we shall open more, for these increased facilities are much appreciated by the Badawin.

Amongst the visitors who come are a large number of women. Thereabouts they are unveiled and talk fearlessly and freely with you. I found these girls very charming and full of courage. They thought nothing of journeys alone with camels across the desert, from the Jof for instance, and it is the women throughout the Hadhramaut who appreciate the peace more than any one. They have often said that in the old days they always lived in fear that when their menfolk parted from them they might not see them again.

Another thing I have noticed from the air all around Al 'Abr are those rows of small heaps of stone often with a large circle of stones at the end of them. These we had found up in the Sei'ar country in 1934 and had been told they were the work of the men of 'Ad. In the Sei'ar country there were always round them plenty of flint implements, and my wife, who on her visit to Al 'Abr was able to explore more of the neighbourhood on the ground, found flint implements in plenty at Al 'Abr. It would be interesting to know what these lines of stones were. It may be remembered that Mr. Bertram Thomas found them also in the Mahra country when starting on his journey across the Rub' al Khali. Most of the *jols* and some of the valley places in the Hadhramaut have flint implements on them, and Miss Caton-Thompson has found a great many.

Politically Al 'Abr is a most useful place, as it enables one to keep easy touch with our own Badawin tribes such as the Nahd, Sei'ar, Kerbi, and Al Bureik, and enables us to make friendly contacts with our neighbours such as the Daham and 'Abida. These latter have asked us to extend peaceful arrangements to them, but we can only reply that they must apply to the Imam of the Yemen.

South of the Sei'ar country across the Wadi Hadhramaut are three other wadis, the 'Irma, Duhr, and Rakhia, with the tribes of which I have as yet only exchanged letters. Single-handed it has been too difficult to do much for them, though they are continually writing of raids in which large numbers of goats and some women have been looted and some men killed. I have seen their country from the air, but Wadi Rakhia is the only one which is at all closely populated and cultivated. South of them again, towards the Wahidi country, are a number of tribes whose country I have not seen even from the air, but who practically all have signed the truce and from whom representatives come to visit me in Seiyun or Mukalla.

In this survey there remains of Qu'aiti and Kathiri territory, the Hadhramaut States, only the Du'an area which I have not had the time to visit more than twice during the past tour, as the roads are not yet completed. You appreciate from the air how closely these deep narrow clefts of Leisar and Du'an are cultivated, for they form brilliant slashes of green in the brown of the surrounding *jols*. My last visit was a day or two before I left, when I was taking Mr. Figgis, my new assistant, round the country to introduce him. We arrived unexpected at Du'an as our letters had been delayed, and as we climbed down the familiar '*aqaba* the sunset call to prayer echoed round the wadi from a dozen minarets.

We stayed again in the Arabian Nights' palace of the Ba Surra brothers, surrounded by the wonderful carving and decoration of their guest house. Each time I see it I am more struck with it, and this time I was tempted to place an order for a complete set of doors, windows, cupboards, pillars, and ceiling for a room. The total cost is estimated at only 800 dollars, rather less than £60, and now I am faced with the problem of building a house somewhere to put it in. The carpenters are tribesmen and, as one would expect, their art is hereditary. They are proud of the fact that they are descended straight from Kinda.

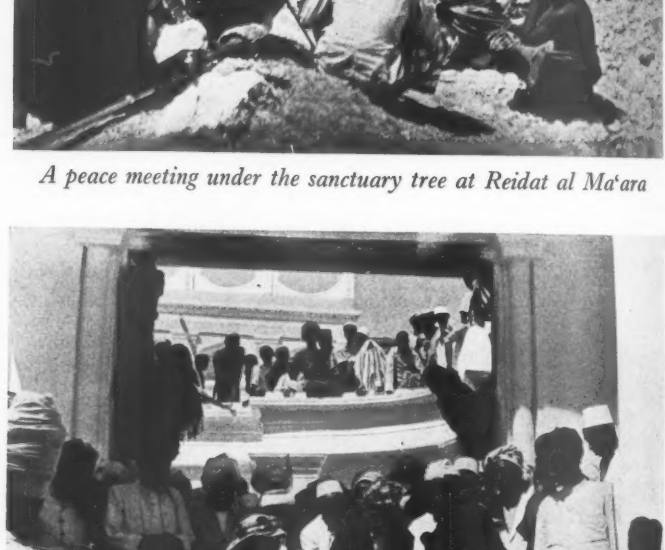
We spent a week-end with the Ba Surras, and after a very large Sunday

Hamumi tribesmen at Shihr

Crossbows in Wadi 'Amd

Wahidi tribesmen at 'Azzan

A peace meeting under the sanctuary tree at Reidat al Ma'ara



Surrender at Seiyun of the Bin Yamani section from Risib

lunch, also in true Arabian Nights' style, as we had lamb stuffed with pistachio nuts, almonds, and raisins, and many other good things, we started off for a round of afternoon calls. Many old friends had come to see us and all wanted us to visit them. However we managed to weed them down to four and thought we would take the farthest first, so we went off through the date palms to Robat where we had an enormous tea, and then came back through Khoreiba, where we had two more and a fourth, just after sunset, at Ar Rashid. Then we staggered back for dinner to Masna'a, Mr. Figgis rather under the weather and wondering how he was going to cope with Hadhrami hospitality after the more modest repasts of Northern Nigeria.

My wife re-visited Du'an at the beginning of 1937, journeying up the well-known caravan road from Mukalla. She travelled with two Seiyids of the Mihdhar family returning to their homes after a long absence, and they took seven days on donkeys from the coast to Wadi Du'an. The nights were spent in the *murabba'as* and towards sunset each evening they raced with an old shepherd taking a flock of Somaliland sheep over the *jols* to Du'an, for he was determined that his sheep should sleep in the stone hut and the Seiyids were equally determined that my wife and they should. There was always a long midday halt for about eleven o'clock the Seiyids felt they needed their ginger coffee, and it was after noon before the large meal of rice and dried fish was ready.

Except for the preparation of two large meals a day everything was very simple. The Seiyids each had a folding iron camp bed and the Badawin, two of whom acted as chief cook and butler-valet, usually slept curled up underneath the beds. The Seiyids had put on clean clothes at the beginning of the journey, and these they wore night and day until they reached the top of the *'aqaba* leading to Du'an, when they unpacked their boxes and put on new clothes to arrive in. Crowds quickly came from their homes to meet them, and from the Ba Surra's house to meet my wife. She spent two nights with the ladies in Masna'a, who were very anxious to know all about Miss Stark, and if she had quite recovered from the illness that attacked her in Du'an. My wife also visited Robat and Khoreiba, and had tea in one house and spent the night in another house in which a crowd of self-invited guests gathered after dinner to hear the wireless, at that time the only set in the wadi. The reception was not too good, but they heard Big Ben and switched from Egypt to Rome, from Palestine to Germany, and back to London.

With the usual Du'an hospitality she was given two breakfasts in different houses, visited many women, and returned to Masna'a for a gay evening party with drums and dancing in the harem. She left Masna'a for Quweira, where she stayed with the Mihdhar family, whose stronghold it is. This clan of Seiyids is very large but firmly united under its chief, Seiyid Mustafa, a very old man who was amazingly ignorant of any matters outside his valley and had never before descended to shaking hands with a European woman. He had evidently seen pictures of them however for he frankly expressed his approval of my wife's dress, which had long sleeves and was not cut short above the knees as he had imagined it would be. She quite lost count of the number of houses she visited in Quweira, and in all of which she was taken straight up to see the women. It is a curiosity of Du'an that all the women dress

alike in long black dresses with coloured patches inserted in front and orange scarves over their heads. They are, too, the only women who affect nose rings similar to those usually worn on the fingers. Very few of them have ever left their valley, but many of them bemoaned the absence of husbands who frequently left them for years at a time.

The Seiyids lent her a magnificent white donkey to go on to Sif where we had stayed before, and the following day she was met by a friend and a car just before reaching Meshhed. Thence she rejoined me in Seiyun.

From Du'an Mr. Figgis and I flew across to 'Azzan over the upper reaches of the Wadi Hajr, which like the Wadi Maseila has perennial water nearly all its length. I had been to 'Azzan before, but this visit was very short, as the machine crashed on the landing-ground. It was a very artistic crash, and in Air Force parlance a complete write-off. Luckily none of the three of us in the machine were in the least hurt and the crash was far more alarming for Mr. Figgis and his pilot still up above, as it was some time before we found a comfortable way of climbing out of the ruins. I hope that in every crash I have I shall have as skilful a pilot as on that occasion. The crash was due to misguided zeal of the locals, for it was their own home-made landing-ground and they had raked up all the stones off the ground into a ridge along its edge, and it was this we hit as we landed. As ours was the machine with the wireless in it we swapped over into the other, which had landed safely, and flew back to Mukalla to organize assistance.

'Azzan is the capital of the Balhaf Sultan and is most picturesquely situated on a citadel rock by the side of the wadi. I was given a great reception on my first visit there with the firing of rifles and war whooping, which is much more a feature of welcomes in the Western Aden Protectorate than in the Eastern. As we walked from the landing-ground to the village the Artillery, a fine old bronze gun marked "A. Wilson. Cossipore. 1841," was brought into play. Our path led below it and it was really rather alarming, because with each discharge a shower of burning shirts and other old clothes, which had been used as wadding, was fired over us.

'Azzan is the only place where I have seen spears surviving, though my wife saw them in the Wadi 'Amd. One or two aged warriors came out with spears which they shook in martial fashion, threw into the air and caught again. Quite a number of old weapons survive in the Hadhramaut, for my wife also saw crossbows in the Wadi 'Amd and there are more of the old matchlocks in the country, some of them still in use, than in any other part of the Protectorate. The Hadhramaut seems to have turned over to modern weapons much more recently than the Western Protectorate, for most of the rifles, modern weapons, have wooden butts covered with goatskin fastened over them to take the recoil, a precaution far more necessary with matchlocks. It is worth recording perhaps that there is a heavy slump in the price of firearms. The ordinary Badawin rifle can be bought for as little as eight dollars with some ammunition thrown in, and the most modern rifles of continental manufacture, which eighteen months ago fetched an easy six hundred or more dollars when brought in from the Yemen, are now not bought at all and offers have been made of them for as little as fifty dollars.

The atmosphere of the Balhaf court is completely tribal; much more like

that of the Sultanates of the West, though I was interested to find that there was a small Jewish community, and this is the nearest that any Jews have got to the Hadhramaut. The Balhaf Sultan, an intelligent young man whom I have known for a long time, came to see me in Seiyun and asked us to help in extending peaceful arrangements to his country. Though most of the sections have signed the truce the situation is still far from settled, as Miss Stark, who arrived at 'Azzan from the Wadi 'Amd shortly after my first visit, will tell.

A short distance down the Wadi Meifa'a from 'Azzan are the ruins of Naqab al Hajar described by Wellstead a hundred years ago. This is Meepha Metropolis. I have only seen the ruins from the air, though Miss Stark has recently visited them. There are inscriptions also at Husn Gharab on the coast which Mr. Martens, one of this winter's visitors, has recently seen. He too was well received.

Bir 'Ali is the other Wahidi Sultanate and, though the old Sultan has no claim to rule outside his wedge-shaped little walled town, he is unfortunately at present unwilling to compose his long-standing differences with the Balhaf and 'Azzan relatives, which makes settlement more difficult. I have lately had both Sultans in Mukalla and tried to get them to bury the hatchet.

I have had little opportunity in this last tour to do more for the Mahras than visit Qishn, their capital, occasionally, and Socotra I have not visited since 1935. It may perhaps be remembered that the Bin Zueidi section of the Mahras did not exactly welcome us when we arrived at the coast through the Wadi Maseila in 1934, and a couple of months ago for the first time the Mahras asked for intervention in their internal affairs, as the Zueidi tyranny in Seihut had become acute. We are now trying in the normal political way of advice and exhortation to induce them to cease their exactions on unarmed merchants and peaceful citizens in a town in which they have no lawful concern, and I paid my last visit to Qishn a day or two before I left Mukalla.

I had intended to visit Gheidha, the most eastern landing-ground in the Aden Protectorate, but we did not get so far and made a landing at Haswein just west of Cape Fartak. The inhabitants said it was the first time that Europeans had been there, though they called me by my name as soon as I stepped out of the machine. These coastal Mahras are a peaceful folk engaging mostly in fishing, and they have pleasant breeze-swept villages of a simple style of architecture, unlike the Hadhramaut but which reminded Mr. Figgis, who was with me, very much of the Arab dwellings in Northern Nigeria. I do not believe we could really have been the first Europeans to visit the place as there is quite an adequate account of it in the Red Sea Pilot, perhaps derived from a visit of Captain Haines in the *Palinurus* over a hundred years ago. Perhaps too there had been a much earlier European visitor, for authorities on classical geography usually identify Ras Fartak, Cape Syragrus, the Boar's Head, as the point from which Hippolus set forth in about A.D. 45 when he discovered the changes of the monsoons. I have long had a wish to put up on this majestic cape of Fartak a simple obelisk with the inscription, a quotation from the *Periplus*, "Hippolus discovered the changes of the

monsoon." Perhaps now that I have visited Haswein this ambition is nearer fulfilment for I do not think the inhabitants would have any objection.

Flying back from Qishn on one occasion we flew inland a good deal and it was most interesting to see some of the Mahra villages of the interior, as they were quite different from anything I had seen before. They were surrounded by thick low walls perhaps between 4 and 5 feet high and 3 feet thick. These walls not only surrounded the villages but their fields as well. It seemed to me that they said very little for security in the Mahra country. We crossed over the Wadi Maseila about half-way up it and its great deep gorge was most impressive from the air.

I hope I have succeeded in giving some idea of this fascinating country in which my lot is for the present cast, and in reaching which I have achieved a desire now fifteen years old. There is still much to be done in the Hadhramaut, but I think it is mainly by specialist surveys that we can help the people to make the most of it. Something has already been done in this direction, for in 1935 Dr. Storm of Bahrein made a leprosy survey, and at the same time Mr. Maxwell Darling investigated the locust question. This last winter we have been fortunate in having two very able American geologists, Dr. Pike and Mr. Wofford, who covered an incredible area on the ground and the whole country by air. It is hoped that most useful additions to the map will result from their work. It was good to have them there, for not only did they thoroughly enjoy the country but the country has thoroughly enjoyed them.

In the last couple of months Mr. V. L. Griffiths, Principal of Bakht er Ruda College in the Sudan, has travelled through the country and made a survey of the present educational resources and future needs. I believe his report will be of great value to us in this all-important matter. Next will come the investigation of the agricultural and water possibilities for which I believe we shall not have long to wait.

Apart from severely utilitarian investigations such as these there has been the visit of Miss Caton-Thompson, Miss Gardner, and Miss Stark, and one may expect that much light on the history and geology of the country will be forthcoming as a result of their researches. I do not know whether the Hadhramaut is likely to be so attractive in this regard as some people have thought in the past, for I believe that Miss Caton-Thompson is inclined to agree with an idea that I have long had that in the times of the old South Arabian kingdoms the Hadhramaut was rather on the fringe of things and that the most interesting area is probably that between Beihan and Marib.

I must not omit to mention that the Hadhramaut has twice had the honour of welcoming the Governor during the last year. On the first occasion when he opened the Al Kaf road he travelled all round the country for ten days, largely by car. He was so much entertained that he came to the conclusion that social life there was even more strenuous than in Aden. On the second occasion he brought with him Lord Dufferin, the Parliamentary Under Secretary of State for the Colonies, and with the honour of this visit the country may well claim to be "on the map." Lord Dufferin could only spare a day and a half, but visited Mukalla, Shihr, and Seiyun, and saw a good deal from the air.

There has been a good deal of reference to air travel in this paper, and I

should like to emphasize the great and beneficial part the Royal Air Force play in the development of the Protectorate. It would be impossible to do anything like so much as is now being done to help the people if they were not there, for it would require a much larger political staff. There are no more popular visitors in the Protectorate than the Air Force and the people are always glad to see them not only for the services they render them, such as the bringing of doctors, the giving of lifts and the carrying of letters, but, perhaps more than all these, simply for their friendly visits and for the good fellowship that results from constant contact.

DISCUSSION

Before the paper the DEPUTY PRESIDENT (Professor KENNETH MASON) said: I have to introduce to-night Mr. Harold Ingrams, the first British Resident in Mukalla. We are about to listen to an extremely interesting lecture, in the course of which we shall hear of the more beneficent side of the uses of aeroplanes. Mr. Ingrams has done great work in the Hadhramaut. I will ask him now to commence his lecture.

Mr. Ingrams then read a summary of the paper printed above, and a discussion followed.

The DEPUTY PRESIDENT: I have had a somewhat unlucky day. I have done my best to persuade the wife of the lecturer to speak to us to-night, but she came here only on the distinct understanding that she should not address us. While sitting beside her during the lecture I have again tried to persuade her to speak, but her answer is "No." However, we have with us Dr. Pike, whom Mr. Ingrams mentioned and who has travelled through the country. I will ask him to be so good as to add a word or two.

Dr. R. W. PIKE: After Mr. Ingrams' marvellous lecture there is little I can do except to confirm many of his statements. Prior to my arrival at Aden I had naturally read some of the publications on the Hadhramaut, and I got the impression that the place was somewhat dangerous; that if people left the coast and travelled inland they did so at their own risk: they survived, but did not have an altogether easy time. Actually when I got there and talked with Mr. Ingrams I found that I could go anywhere I liked.

Very shortly after my arrival in the country I learned of the legend that has grown up around Mr. Ingrams. You heard him say that one thousand members of the Sei'ar tribe signed a peace treaty. I understand he achieved that completely single-handed; he did not have the Royal Air Force with him; so far as I know he went to the country of the tribe armed merely with the idea that the Hadhramaut needed him and he needed the Hadhramaut. After the peace treaty was signed there were heavy rains, and prosperous crops, and everybody felt extremely grateful.

Later, he went down Wadi Hadhramaut with Mrs. Ingrams, and I understand that they were then confronted by a very serious situation which might have cost them their lives. They were exceedingly reticent about all that, but I want to point out that Mr. Ingrams has not had too easy a time. Though things are getting easier now, at the beginning they certainly had a great deal of difficulty. The man who interfered with his progress was later carried away by a flood; he was the only man drowned by the flood; and that more or less impressed upon the people that Mr. Ingrams was there to stay and that he had some special powers. He now has the reputation which he has very justly earned.

Everything is going along admirably and travellers can go practically anywhere they like in the country. Mr. Ingrams spoke of a few odds and ends still to be pacified, but I think that it is rapidly taking place.

I would like to thank Mr. and Mrs. Ingrams for the kind hospitality that Mr. Wofford and I received. And before I sit down I ought to bring Mrs. Ingrams out of hiding. She has helped her husband most ably. I really was much impressed by what she did for him in every conceivable up-station into which she was capable of going and, moreover, when the work piles up, she goes without sleep.

Lord LAMINGTON: I happen to have been in Aden two or three years ago and I heard so much of the wonderful results obtained by Mr. Ingrams in the Hadhramaut that I would like to bear testimony to the great reputation he has in that neighbourhood. It is a wonderful stretch of country of which we have heard to-night. The political life is bound up with Aden to the west, whereas its social and commercial life is mainly to the east with India. Considering the wild rocky country so prevalent in the Hadhramaut its prosperity is extraordinary. I have flown over a portion of the Aden Protectorate to the 'Audhali tribe and from the pictures that have been shown the two areas do not seem very dissimilar. I only wish to emphasize that our lecturer has a very distinguished reputation, as a result of his achievements in the Hadhramaut in the way of investigation and in assisting to put matters on to a proper footing in that very interesting country. I am not however going to delineate anything that has come to me through hearsay evidence.

Miss E. W. GARDNER: I would like to add my testimony to that of Dr. Pike in regard to the great work Mr. Ingrams, and may I also add Mrs. Ingrams, are doing in the Hadhramaut. I found their house an open house to me, as it is indeed to everybody who visits the country. We were welcomed with the greatest hospitality; everything possible was done for us and our safety was considered. Indeed, in no part in which I have been in the east have I found travel so safe as in the Hadhramaut. If you think of the conditions which existed there until a few years ago you will realize what that statement means. The change is all due to the work done by Mr. and Mrs. Ingrams. We found their name an open sesame to us wherever we went. We were asked did we know "Ingrams" and even more in the Hadhramaut did we know "Doreen," because it is, in a way, a democratic country, and everybody is known by his or her Christian name.

Mr. Ingrams was regarded as a great rain-maker. We were told that ever since peace had come as a result of his work the rains had never failed. That was put down not to the mercy of God but directly to Mr. Ingrams. I add my tribute of appreciation of his lecture and say how much I have enjoyed it.

The PRESIDENT: We have with us to-night a representative of the Colonial Office, but again I must admit I have been unlucky. He informed me at dinner that he was coming here to learn and not to teach, so that I cannot call upon him to address us. Unless anybody else wishes to contribute to the discussion, I ask you to accord a hearty vote of thanks to Mr. Ingrams for an extraordinarily interesting lecture, also to his wife, the rain-makers and the peace-makers of the Hadhramaut.

AN ARCHAEOLOGICAL JOURNEY IN WESTERN IRAN

SIR AUREL STEIN

IN Shiraz there ended in May 1934 the third of the journeys which had carried me from the extreme south-east of Iran and up the Gulf coast into Fars, the ancient Persis. It was hence appropriate that the latest and longest of my Persian journeys should start from Shiraz, the modern capital of that ancient Persis to which Iran owes so much of its historical greatness and culture under the Achaemenian and Sasanian dynasties, and from which not unjustly it has taken its classical name in the West. The help kindly accorded by the late Iranian Minister in London, H.E. Mirza Hussein Ala, and by the British Legation at Tehran, had been mainly instrumental in securing the Iranian Government's generous permission for the intended explorations. For the ready sanctioning of my plan and the manifold facilities afforded which rendered its execution possible, I cannot feel too grateful.

My practical preparations after my arrival in Shiraz early in November 1935 were greatly facilitated by the friendly interest shown in them by H.E. Majid Khan Ahi, the enlightened late Governor General of Fars, and by the convenient base provided at the British Consulate through the kind hospitality of Colonel and Mrs. Hoyland.

Already on landing at Bushire I had been joined by M. Bahman Karimi, the able Inspector of Antiquities whom the Ministry of Public Instruction had deputed from Tehran to accompany me on my travels. He showed throughout keen interest in my investigations and proved ever willing to make the needful arrangements with the local authorities. For the topographical work which, as on all my former journeys, I was anxious to combine with archaeological exploration on ground as yet inadequately surveyed, I was once more provided by the Survey of India with a very capable and indefatigable assistant in the person of Surveyor Muhammad Ayub Khan, a Yusufzai Pathan. The results of the plane-table work, carried out on the $\frac{1}{4}$-inch scale and supplemented by regular barometer and clinometer observations, are embodied in the accompanying map.

During our stay at Shiraz I was able to provide our party with suitable transport in the shape of sixteen hardy mules hired from Kazarun. As on my preceding journey in Fars, I had every reason to feel grateful for the powers of endurance displayed by these excellent animals even on the worst tracks over which our journey in the hills took us. It was the same also as regards the care with which they were looked after by their hard-worked owners. It was a boon to feel assured that with such transport weather conditions, however much they affected the ground during the winter rains, could not seriously impede our progress. The use of motor transport on the high roads connecting the main centres of trade and traffic has in recent years greatly reduced employment for mules, and in consequence also the rates of their hire. This was very satisfactory since all expenses on this journey had to be met from my own purse.

The initial portion of my programme was to lead us along the ancient main route connecting Fars with Khuzistan, the Elam of the Bible, or

Susiana as known to the classical world from its famous capital, Susa. I had not to wait long for fulfilment of the hope that we might find ancient remains along this route awaiting exploration. We had moved up from Shiraz only three marches among hills where scattered plantations, now mostly abandoned, attest that production of wine which made Shiraz famous of old, when in the broad elevated plain below the town of Ardakan a small isolated mound attracted attention. A few days' trial excavation disclosed plentiful remains of chalcolithic times in the shape of painted pottery and stone implements. Their evidence showed that this well-watered high ground, close on 7000 feet above the sea, where winter had already set in with bitterly cold winds, had in the fourth-third millennium B.C. known conditions of civilized settled life similar to those prevailing at the same period in several of the lower valleys of Fars previously visited by me.

While the area near Shiraz had suffered much through fighting between the rival factions of Qashqai and Qawam chiefs, the fertile tract of Ardakan had, until the strong regime of His Majesty Riza Shah Pahlavi secured peace and order, been exposed to constant depredations by turbulent Mamasani tribes. There was curious evidence of the disturbed conditions once prevailing to be noted in the small town of Ardakan. The nomadic tribe of the Buyair Ahmad had been specially distinguished for their raiding. To them it had served as the place where they could dispose of the proceeds of their forays carried out on the roads towards Isfahan and Shiraz. There they could also arrange for the supply of their civilized needs in the way of tea, sugar, and the like. The substantial houses of the Ardakan headmen who had acted as receivers for the booty were now occupied by local officials while their owners were duly kept among the many *détenus* at Tehran.

From Ardakan I proceeded westwards to regain the main route leading from Shiraz to the plains of Khuzistan. It had been left by us some 18 miles farther to the south. The track we were following led for about 13 miles across broad barren downs furrowed by deep-cut stream beds. Then it crossed a steep ridge marking the rim of the central Persian plateau by the Bolsoru pass at a height of about 7500 feet. From there we descended very abruptly through dense oak forest into the fairly open head of a valley known lower down as Tang-i-Khas. The topographical indications here gained by our plane-table work on ground not previously surveyed have thrown interesting new light on the operations by which Alexander forced his hard-won passage through the "Persian Gates" on his advance from Susiana and the Uxian hills to Persepolis.

This is not the place to detail all local observations. They conclusively prove that the ancient route, marked by a succession of remains, led, just as the present caravan track does, from the ruined "Bridge of the myrtles" (*Pul-i-murd*) through the defiles of the Tang-i-Gerrau, a lower continuation of the Tang-i-Khas, up the very steep rocky slopes above the left bank of the stream in the latter (Plate 1). Diverging thence to the south-east it reached the pass by which the watershed towards the Ardakan drainage is crossed by the present trade route to Shiraz at an elevation some 400 feet lower than the Bolsoru pass. That Alexander on his march towards the "Persian Gates" had proceeded by this trade route had already been recognized by

Kinneir in his 'Geography of the Persian Empire' early in the last century. But without proper acquaintance with the ground, of which no exact survey was available, it was impossible to follow closely the movements which enabled Alexander under great difficulties to turn Ariobarzanes' Persian force holding the pass and, after destroying it, to open his way unopposed to the capital at Persepolis.

Now the fairly detailed and concordant accounts of Alexander's historians (Arrian, Curtius, Diodorus) tell us that the Macedonians' direct attack, after the enemy had allowed them to advance into the defiles below the pass, was beaten off. They had suffered heavy losses from the great stones rolled down and the missiles discharged upon them from the precipitous slopes above. Alexander, repulsed for the first time in his victorious progress through the Persian empire, was obliged to recall his troops to a camp placed in an open position about 30 stadia, or $3^1/_2$ miles, from the ground held by the enemy. From the very precarious situation following this initial defeat Alexander extricated his force only with much difficulty. Led by a local guide he made his way during the night with light armed troops by a difficult path up very steep forest-clad slopes away from the approach to the defenders' position. When the rim of the plateau had been gained with a great effort and his exhausted troops had been given some rest, one detachment was sent off direct towards Persepolis over easier ground. Alexander himself, proceeding by a rough path, made a turning movement which brought him before the following dawn upon the Persian outposts. After putting these to flight he "quite unobserved just at dawn, assaulted the camp of Ariobarzanes." At the same time the force under Craterus which had been left behind by Alexander, moved up to attack the enemy holding the pass. Thus hemmed in on both sides the Persians were put to flight with great slaughter.

A look at the inset map prepared from our plane-table survey and a route-sketch along the caravan track made by Professor E. Herzfeld in 1905 shows how closely the operations I have briefly summarized agree with the topographical features observed on our move across the head of the Ardakan plateau and on the subsequent descent into the head of the Tang-i-Khas valley. This descent from the Bolsoru pass led down the slopes of the Paskohak massif covered throughout with dense oak forest. For close on 3 miles it was so steep as to be barely practicable for laden mules. Then, after we had camped for the night of November 27 at an elevation of 6200 feet on a small patch of fairly level ground, two more miles of descent next morning brought us to a large open space occupied by gently sloping fields and known as Mullah Susan.

It is here that we can safely assume Alexander's camp to have stood after the attack along the caravan route to the pass had been beaten back. The track leading to it was clearly seen by us winding up under precipitous rocky slopes. These would make it easy for a force holding the heights to stop any advance towards the pass by the method of defence described in the texts. The distance between the open ground at Mullah Susan and the point where the caravan track enters a narrow defile before attaining the pass corresponds as closely as may be to the 30 stadia or $3^1/_2$ miles which Curtius records as the distance over which Alexander withdrew when the assault was abandoned.

In the same way the march of some 100 stadia or about 12½ miles, which in Arrian's sober and precise account is mentioned as covered by Alexander's turning movement on "a difficult and rough path," closely agrees with the distance to be traversed from Mullah Susan to the Bolsoru pass and thence across much broken ground to the rear of the pass held by the Persians above Aliabad.

It is equally easy to reconcile with the actual configuration of the ground Curtius' statement that after ascending to the pass across the range Alexander himself turned to the right, *i.e.* to the south-east, in order to take Ariobarzanes in the rear, while a column from his force was left under Philotas and Coenos to proceed over easier ground, obviously across the open plateau of Ardakan, in the direction of Persepolis. From Arrian we learn that it was this column marching towards the plain which reached the Araxes (the Pulvar river) before Alexander, and bridged it in accordance with his instructions. Thus it was made possible for him after his victory at the pass to hasten to Persepolis at full speed and to secure the royal treasure there before it had been plundered by the garrison.

On our way down the picturesque Tang-i-Gerrau we came repeatedly upon traces of an old made road. Where it had crossed the deep stream of Ab-i-Laleh coming from the north-west we could examine the ruin of the ancient bridge known as *Pul-i-Murd*, the "Bridge of myrtles" (Plate 2). Professor Herzfeld, who on his memorable journey of 1905 to Shiraz had followed this road, had rightly recognized the construction of the bridge as dating from Sasanian times. Farther on we were to find quite a succession of ruined bridges proving the care which had been taken in this period, and probably earlier also, to assure the passage of all streams likely to be unfordable at times of flood for caravan traffic and military movements.

From the mouth of the Tang-i-Gerrau, where the tree growth clothing the hill slopes was finally left behind, we entered the wide valley of Fahliun. This naturally fertile and easily irrigated tract must have been of economic importance before it became depopulated in consequence of the tribal feuds and general insecurity prevailing here until quite recent times. From it there diverges to the south-east a much-frequented route, described by early Arab geographers. Passing through the fertile tracts of Shapur and Kazarun it attains Shiraz over easier ground. On this account it was, though longer, preferred during Muhammadan times, and probably earlier also, to the direct route through the "Persian Gates."

There is no doubt about this route being meant where Arrian (*Anabasis*, III, xviii, transl. E. I. Robson) tells us that Alexander after forcing his way into the territory of the Uxian hillmen, "sent off the baggage trains, the Thessalian cavalry, the allies, the mercenaries, and all the other heavier-armed troops of his army with Parmenio to lead them against the Persians by the main road which leads into their country (*i.e.* Persis)."

Close to where the stream from the Tang-i-Gerrau enters the open Fahliun valley and joins the larger one carrying the drainage from the Ardakan plateau and known as the Rud-i-Shashpir, there rises a remarkable table mountain to a height of about 6000 feet. It figures in Muhammadan records and in widespread legendary lore as the almost impregnable stronghold of Qal'a-

safid, the "White Castle." Of Timur it is stated that he besieged and took it on his march from Khuzistan into Fars. That the mountain, imposing in its isolation, was not merely a natural fastness as had been believed, but carried also ancient remains, was proved by the ascent made on November 30 from our camp at Dasht-i-raz village. Guided by Khalil Khan, a Jawi chief, owning a picturesque orchard-girt seat at the west foot of the mountain, we arrived by a steep path just practicable on horseback, at a point fully 3000 feet above the valley from where wall-like cliffs of limestone rise up to the edge of the mountain top. Access to this was gained by clambering in zigzags up narrow rocky ledges to where at an elevation of *circ.* 5700 feet a fortified gatehouse is passed. Its constructive features point distinctly to Sasanian times.

From there a slightly less difficult scramble, along step-like rock ledges and then over steep wooded slopes, brought us to the rim of the plateau which forms the top of the mountain some 300 feet higher up. The plateau, roughly oblong in shape, measures more than 4 miles in circumference. Small eroded nullahs divide it into four gently sloping broad ridges. At the head of one of these nullahs issues a small perennial spring. The presence of water explains how the mountain could serve as a place of refuge defensible for some length of time, and otherwise also for prolonged occupation. Its top is clothed with plentiful vegetation, and along the western ridge remains of vineyards planted at no distant time could be traced. Higher up the same ridge is occupied by the ruins of decayed dwellings stretching on terraced ground for about two-thirds of a mile. Abundance of pottery debris, including many fragments of fine blue glazed ware, was found near the ruins, attesting continued occupation during historical times.

The construction of the larger houses, with walls of stone set in concrete, clearly pointed to Sasanian times. The same was observed in two "gates" closing the heads of precipitous ravines in which good climbers might gain access to the top by difficult paths known to the local hillmen. The natural strength of the fastness and the difficulty of completely blockading its approaches is so great that the traditional fame of Timur's exploit in gaining possession of it is easily understood. At the same time the Qal'a-safid is too far removed from the route leading to the "Persian Gates" to be considered as ever having commanded it.

On our march down the wide valley plain traversed by the Fahliun river I noticed at two points evidence of the importance which this fertile tract, now occupied only by wretched hamlets amidst malaria-breeding rice-fields, must have claimed at early periods. Following up the right bank of the river to where it makes a sharp bend under a precipitous rocky spur I visited on the top of the latter a very interesting but much effaced rock carving in relief. Professor Herzfeld ascribes it to prehistoric Elamite rule in these parts, perhaps about the second millennium B.C. Its position was explained when I found quite close to it the remains, partly rock-cut, of what probably was an ancient watch-station, guarding a narrow artificial path which winds along the cliffs below it. The view commanded by it was very extensive. How large the cultivated area to the north of the river must have once been was shown by miles of terraced slopes covered with the debris of completely

decayed stone-built dwellings. They stretch along the foot of the hill range to the north and east of the mound and hamlet of Tel-espid.

When moving from there to the north-east we came after some 4 miles to a low saddle known as the *Kotal-i-sangar* (the "Pass of the stone wall"). There the old caravan route passes through a defile flanked on both sides by high spurs falling off in precipitous cliffs. The saddle is nearly a mile wide and is closed by a roughly built wall of large stones, in places almost effaced. It runs up on either side to the foot of unscalable rock walls and thus forms a regular *chiusa*. Certain indications pointed to considerable age and suggested that the wall marked a place where the hillmen could conveniently levy dues on caravans passing their territory.

I could not therefore help thinking of the story told by Arrian (*Anabasis*, III, xvii, 2–5) of the defile where the Uxian hillmen waited for Alexander on his march from Susa towards Persis, expecting to be paid "what they usually received from the Persian king whenever he made a progress that way." Their claim was obviously for "tribal allowances," to use the term familiar on the Indian North-West Frontier. There the experience gained in the course of a century has made it appear expedient to those responsible for the main line of communication from Afghan territory into India to pay such allowances to the Afridi tribes holding the Khyber. Alexander had in reply to their demand bidden the Uxian hillmen "to come to the pass; which while they held it, made them feel that the way through into Persis was in their hands, there to receive the accustomed payment from himself also." Alexander however with a part of his army, "during the night marched by another than the obvious road, being guided by the Susians," fell upon the Uxian villages unawares, and then arrived swiftly in the rear of the pass "where the Uxians were likely to oppose him in full force." "Overmastered at the very position in which they had chiefly put their trust," they were forced into precipitous flight with great slaughter.

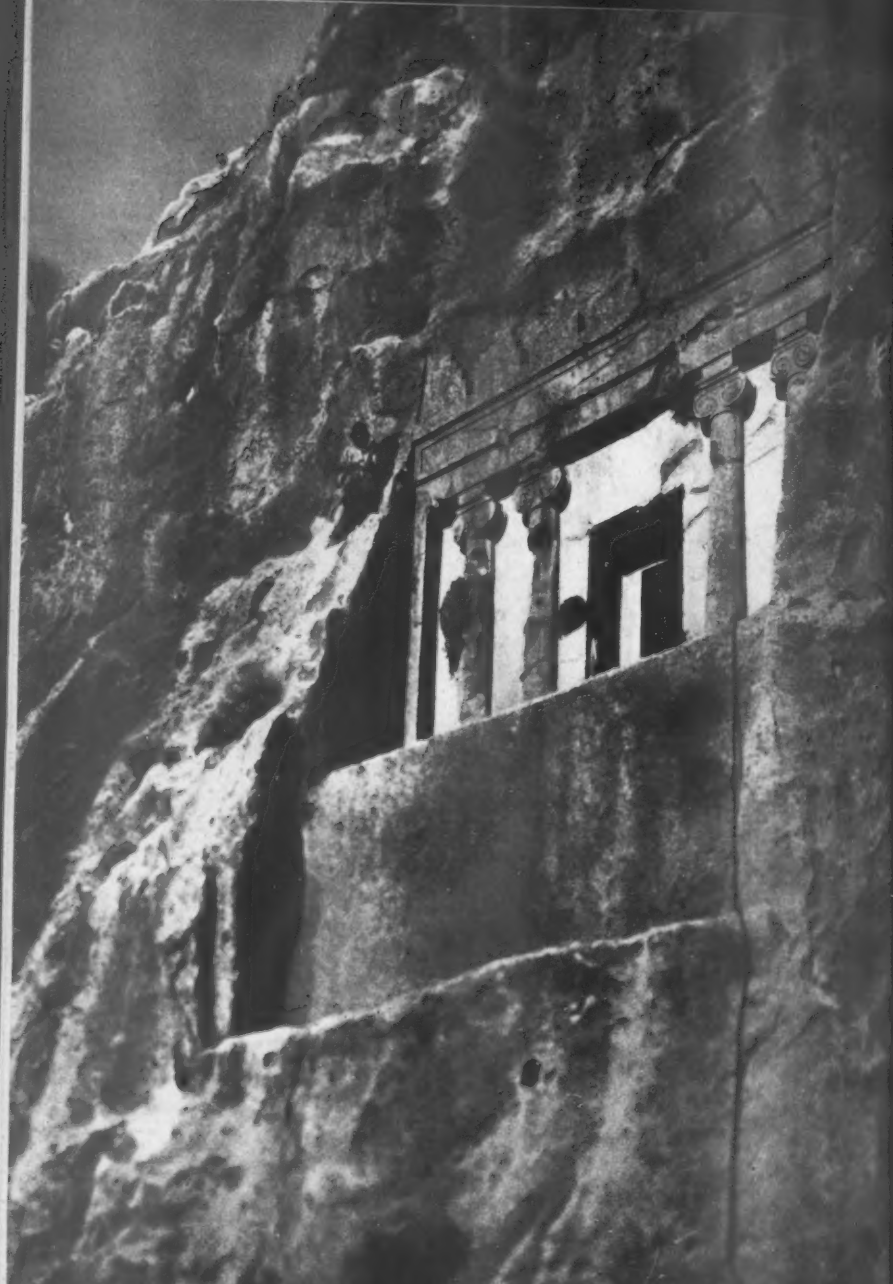
The absence of detailed indications both in Arrian's text and in the generally concordant but much briefer account of Diodorus makes it impossible to determine the line taken by Alexander in his turning movement through the hills on either side of the defile. But the reference made by Arrian to the quantity of plunder captured in the Uxian villages makes it obvious that the turning movement must have brought Alexander into the Fahliun tract. This is by far the largest area of cultivable ground that can come into consideration along the line of his advance towards the "Persian Gates."

The valley of Deh-i-nau into which the "Pass of the stone wall" took us, proved much smaller but equally well watered. Yet this naturally fertile ground is so sparsely populated at present that sufficient labour could not be readily obtained for trial excavation at a couple of small mounds manifestly prehistoric. Farther down we came upon a fine piece of ancient engineering in a massive barrage, probably Sasanian, built to hold up a small stream for irrigation. The remains of a small ruined watermill met a few hundred feet higher up seemed to date from the same period.

But an earlier and far more imposing monument of antiquity presented itself in a great rock-cut tomb sighted on a high and precipitous mountain-side beyond the torrent bed of Tang-i-shir (Plate 3). From the pairs of double

1. The Tang-i-Khas valley

2. Pul-i-Murd, the Bridge of the Myrtles



3. Rock-cut tomb of Da-u-dukhtar, Deh-i-nau valley

columns of reddish limestone flanking the entrance to the tomb chamber it is known as Da-u-dukhtar, the "Nurse and the princess." The ascent to it proved a very stiff climb of some 500 feet. On reaching a narrow terrace at the foot of the perpendicular rock wall below the tomb I gained a good view of its front. But I realized also that even if I had not lost my toes it would not have been practicable for me to reach this. Fortunately a Kohgalu herdsman whom we had brought along managed to clamber up like a spider over the narrowest fissures and toe-holds. He proved intelligent enough to handle a tape measure we gave him, and thus to secure for us approximate measurements. Professor Herzfeld had seen the tomb before, and the reference he has made to it in his recent Schleich lectures confirms the report that the rectangular chamber within is void of any burial-place or inscription. The most striking architectural features of the façade are the Ionian-looking capitals of the columns; with the abacus and double architrave they seem to suggest Greek influence.

Remains of far greater dimensions and distinct architectural interest revealed themselves next morning on following down the old line of road through the narrow picturesque gorge of Tang-i-Brin. In it the lively stream draining the Deh-i-nau valley breaks through the hill range dividing it from Basht. The modern caravan route crosses the range some distance farther up. This accounts for the two ruined bridges found close to the mouth of the gorge at a short distance from each other not having been noticed in earlier accounts. Their examination provided quite a fascinating task. Several architectural features, such as semicircular arches and the masonry of solid concrete, proved that the upper bridge was the older and a work of Sasanian times. It spanned the stream where it emerges from the gorge, with a width of some 60 yards, by a single bold arch. This must have fallen by the time the bridge lower down was built. But the massive buttressed piers on which this great arch rested still rise in impressive strength, the one on the right bank to a height of some 45 feet. In order to give access to this height and the still greater one of the arch spanning the river eight subsidiary arches had been built along the cliffs of the left bank.

This approach was skilfully utilized later by an extension of fifteen more arches to give access to the lower bridge. This latter bridge dates from early Muhammadan times and was thrown across the river, here about 100 yards wide, by means of two large arches resting on an intermediate pier. The aim of the later builders had been defeated here also by some exceptionally high flood, and the solid mass of cemented masonry from the intermediate pier now lies upheaved in the bed.

More puzzling, if less imposing, were the remains of a large oblong base found on the left bank a short distance above the older bridge. It was faced with carefully cut slabs of great size which had once been secured with metal clamps. This method of construction pointed to the Achaemenian or the immediately succeeding period. The purpose of the isolated structure which this solid base had once carried seemed very puzzling until I observed a block of massive stonework just opposite, high up on the precipitous rock face of the right bank. It suggested that these two structures may have served to anchor some kind of a suspension bridge, older than either of the two bridges. The approach on the right bank is too rocky and narrow to have admitted

any but men on foot or led animals. But even such a bridge, constructed like a *jhula* in Kashmir or the Hindukush, would have sufficed to assure communication whenever the stream in flood was otherwise impassable.

On fording the stream of the Tang-i-Brin we had left Fars behind and entered the province of Khuzistan. The ground in the valleys here became distinctly more arid and cultivation even scarcer than before. Significant proof of these physical conditions having prevailed also in earlier periods was afforded by the ruined cisterns met at varying distances along the old road from here onwards. A couple of marches brought us again to ancient remains at the mouth of a torrent bed known as Tang-i-Maliun, the "Devil's gorge." Among the numerous ruins marking here a fairly large settlement of Sasanian times, there was one of special interest. It was a small but fairly well preserved residence, once probably occupied by a principal landowner. It was an instructive task to prepare a careful plan of the house, with its reception hall, dwelling rooms, court and servants' quarters, all comprised within a compact square capable of defence.

It was the same also with a fortified enclosure some distance off. Its lay-out with a massive square keep at one end of the oblong enclosure, with small bastions defending the curtain walls and a kind of ravelin protecting the gateway curiously recalled one of those *castella* to be seen on the Roman *Limes* in the Syrian desert. Might he who constructed the post have become personally acquainted with some of those border defences by which Rome for centuries succeeded in warding off Persian inroads into its Near-Eastern provinces? Or was its construction carried out by some Roman officer or engineer among the captives made by a Sasanian army? The well, now dry, within the enclosure proved to lie in the line of an old abandoned *qanat* or subterraneous canal. This accounted for the occupation of this now waterless ground.

As we moved along barren foothills dominated by the Khumi massif rising to close on 10,000 feet and capped with snow at the time, we came upon the ruin of a large and well-planned Sasanian residence defended by walls and fosse. Around a central domed hall, now collapsed, vaulted corridors and outside apartments forming concentric squares were disposed in an ingenious fashion. The ruined dwellings high up in the valley of Shaikh Khwaja, to which a trying ascent from the village of Do-gumbadan brought us, proved to date only from the sixteenth to the seventeenth centuries. Then we resumed our march by the old road. After passing in parts through a maze of deeply eroded gypsum hills, where oil had been found, it brought us to the eastern edge of the wide Behbehan basin.

There, above the hamlet of Khairabad, we came again upon a pair of ruined bridges which once spanned the considerable river descending from the valley of Deh-dasht. Of the lower one, dating from Sasanian times, there remained only one large semicircular arch adjoining the massive pier from which the arch spanning the river had sprung. On the bank above there stands a ruined square hall with openings on all four sides with noble semicircular arches. The masonry in the walls which carry what survives of the domed roof consists, as in the arch of the bridge below, of rough stones set in cement and still retaining in places a facing of very hard plaster. The purpose of the structure,

impressive even in its ruined state, could scarcely have been anything else but to serve as a *takht* or royal pavilion from which to watch the river passage.

Far more imposing are the remains of a later bridge farther up (Plate 4), of which three arches on the right bank and two on the left still survive. The central arch to which they formed the approach has completely fallen. It appears to have spanned the river, here flowing in a rock-cut bed about 60 yards wide, with a single vaulting. The heavy buttressing of the pier on the right bank shows the thrust it had to bear. The pointed tops of the surviving arches and the facing of the piers with small cut slabs left no doubt about this upper bridge having been built in early Muhammadan times, when the Sasanian one had fallen into ruin.

The town of Behbehan lies in the centre of a wide plain to which irrigation from underground canals, if restored, might, as in earlier historical times, assure abundant resources. Here we were detained by a succession of rainy days. The intervals were utilized for the examination of a number of small mounds in the vicinity. Definite evidence of prehistoric occupation was found only at one of them. There a trial excavation, short as it was, brought to light a quantity of ceramic ware painted in monochrome with designs closely resembling in type those characteristic of pottery found before at chalcolithic sites of Fars. It sufficed to prove the extension of the same prehistoric civilization as traced on my former journeys through great portions of southern Persia into parts near the head of the Gulf and once included in ancient Elam. Elsewhere surface indications pointed mainly to settlement within historical periods. Our stay at Behbehan proved useful for securing the help of Colonel Zindehdil Khan, the very able and energetic local administrator, for making needful arrangements about escort and guidance in the Kohgalu hills in the north, as yet practically unsurveyed.

The route chosen at our start on Christmas Day allowed me to visit the remains of Arrajan town on the left bank of the Marun river and the ancient bridge reported near it. Of that once important town, occupied in early Muhammadan times and probably before also, nothing could be seen above ground but extensive low heaps of debris. The young green cropping out after the recent rain was charitably covering them up. More interesting it was to survey the ruins of the great bridge which once served the abundant traffic passing from Khuzistan through Arrajan towards central Persia. Arab geographers of the ninth to tenth centuries have left us impressive descriptions of the mighty arch of stone which spanned the river bed, fully 100 yards wide, where it is confined between projecting steep cliffs.

This great arch has completely disappeared now, and of the piers which once bore it, only the lowest portion of the one on the left bank is still standing. But the huge boulders used for a breakwater to protect it against floods and those buttressing the foundations attest the care taken to make this pier equal to the thrust it had to bear. On the right bank, against which the floods set with increased force owing to the sharp bend of the river, the several piers have been almost completely swept away. But the four massive embankments which once bore them have survived with but little injury. What remains of the masonry there and in the piers on the left bank seems to bear out the

statement of one of the Arab geographers assigning the bridge to the time following the Muslim conquest.

The extensive ruins of an "old town" near the village group of Tashan, to which our first march beyond the river brought us on December 28, proved too well preserved to date back farther than the period of the great Safavi dynasty, the sixteenth to seventeenth centuries. The abandonment of the town is accounted for by the disturbed conditions prevailing in the Kohgalu hills until recent years through tribal feuds and banditry. Now order is fortunately assured by the efficient control which the present regime has established over the tribes. Though saved from trouble in this respect we found our moves in these hills trying enough otherwise. Recent rains had made the steep and slippery slopes of the prevailing gypsum formations impracticable for any laden animals except such hardy mules as we had brought from Shiraz. Even they had again and again to be relieved of their loads and the baggage man-handled at the worst points.

The ruined town of Deh-dasht (Plate 6) reached after three tiring marches from Tashan, proved interesting enough even though none of its remains could claim greater antiquity than the Safavi period. The strong rule of that dynasty had assured security for the old trade route which had passed here towards Isfahan, the capital of the period. Deh-dasht had owed its former importance to its convenient position on this route, to the protection afforded by an elevation of some 2700 feet from the heat of the plains, and to the local resources which cultivation in the broad valley near by, now practically uninhabited, had once provided.

From a distance the deserted town looked quite imposing, with its hundreds of stone-built houses crowding closely on and around a rocky hillock. Inside the crumbling town wall many substantial buildings, including large *sarais*, mosques and comfortable mansions, were ranged along the narrow streets. All wrapt in utter silence, they presented an impressive scene of decay. But my people did not at all like the eerie look of the dead place nor the total absence of creature comforts for men or beasts, and were glad to leave it behind.

From here we turned to the north-west and after recrossing the Marun river reached Lindeh, the headquarters of the chief of the Taiyibi tribe. Escorted by him and his armed followers we then made our way early in January 1936 across a very trying succession of steep ridges and deep-cut ravines to the border of the mountain tract held by the once very troublesome Bahmai tribe. To reach thence the rock sculptures beyond the Tang-i-Sarvak pass for which I was bound proved a difficult undertaking, for the very narrow well-wooded gorge through which the ascent led was found blocked at many points at its bottom by projecting rocks and fallen limestone boulders. It was only after great exertion that, with the mules dragged up unladen and the baggage carried by our few men over seemingly impossible places, the pass, snow-covered at the time, could be gained at a height of 5300 feet. After a night passed there we descended to the head of the valley on the opposite side. It is called *Tang-i-Sarvak* from its growth of fine cypresses.

The relief sculptures found there on large detached rocks had been first seen nearly a century ago by Baron de Bode on a hurried visit paid from the caravan

4. Bridge above Khairabad, Behbehan

5. Ruined watch-station, Kohgalu

6. Ruined town of Deh-dasht, Kohgalu

7. Rock-cut relievo, Tang-i-Sarvak valley

8. Relief carving of a cataphract, Tang-i-Sarvak valley

road leading into the Bakhtiari country. They proved far more interesting than expected. The largest of the relievos is cut on one face of a detached dark rock over 20 feet high (Plate 7). It represents in the top register rows of attendants standing by the side of a seated royal personage and below four figures turned in the same direction and with their raised hands apparently pointing upwards to an object of worship. To the right of these is shown a horseman in typical Parthian attire charging a lion standing up on its hind legs. In the bottom register there was seen, after it had been cleared, a large standing figure grasping with the right hand the gorge of a seated lion. The surface of the rock has weathered badly on this side and does not allow all details of the attire of the seated figure and of the attendants to be made out. But the hairdress, the long coats and bulging wide trousers distinctly recall Parthian representations.

This style is quite unmistakable in the colossal figure which occupies the north-western fairly flat corner (Plate 11). It is that of an elaborately dressed personage or Magus pointing with his raised right arm to an altar above, which bears a baetyl or linga-like object adorned with a floating scarf. The scene is obviously intended for religious propaganda. Two inscriptions in Aramaic characters of a proto-Pahlavi type cut below the altar and near the charging horseman also point to the late Parthian period.

The northern face of the rock which partly overhangs and has also suffered much from weathering bears reliefs carved in two registers. The upper one shows a large male figure reclining with bent legs on a couch and holding a wreath or crown in the right hand. The four corners of the couch are borne by what look like birds with outspread wings and feet ending in talons. The two figures seen to the right, seated and holding spears, and three others in the lower register, standing, afford no definite clue for the interpretation of this relief.

Somewhat better preserved and more striking is the relief carving on another detached rock close by. There is seen the figure of a horseman completely clad in mail, as is his steed also, in the act of charging with a mighty lance at an enemy (Plate 8). The figure of the latter is likely to have occupied the rest of the rock face now fallen off. It was easy to recognize there a spirited representation of those cataphracts of the Iranian armies from Parthian times downwards, who for centuries proved formidable foes to Roman and Byzantine forces. Behind and above the mailed knight are shown figures, on a much smaller scale, of an archer rapidly advancing with drawn bow and of a captive following behind.

Among other reliefs found on smaller rocks some distance both above and below may be mentioned one showing a priestly figure with the right arm raised above a fire altar. By its side passes an ancient well-aligned and paved track. It is traceable for about a mile from near the mouth of the gorge. It has no continuation beyond the main group of reliefs. This suggests that its purpose was not to facilitate traffic across the pass but to make the open head of the valley below it conveniently accessible. Could this, with its fine trees, spring and cool air, have served as a kind of "hill station" and summer retreat for the local chief or administrator of the hot plain below?

Owing to bad weather with rain and bitterly cold winds it took several days

to secure photographs of all the rock carvings and estampages of the inscriptions. Then we turned north towards the Bakhtiari hills. After a succession of marches across hills for the most part lacking permanent habitations we reached ground which just a century ago had seen that great scholar, explorer, and diplomat, Sir Henry Rawlinson, pass on a memorable expedition. On the way to Qal'a-i-tul, once a seat of great Bakhtiari chiefs, I was able on a much broken limestone plateau to examine an interesting ruin known as *Gach-darwazeh*, the "Gypsum gate" (Plate 5). Instead of being, as former accounts had it, a mere toll gate, it was easily recognized as a watch-station, probably of Parthian times, exactly of the same type as the *castella* of a kind of *Limes* I had traced twenty years ago on desert ground south of Sistan.

At Manjanik, the first village beyond, there were to be visited extensive ruins of a large settlement dating from Sasanian times and crowded with decayed vaulted dwellings. Then at the foot of the great mound which bears the rapidly decaying castle of the Qal'a-i-tul, I found proof of the very early occupation of the site in the shape of a large relief-decorated limestone block accidentally brought to light recently. The style of the carefully modelled sacrificial scene represented on it indicates the extension of Elamite domination into this hill tract about the second millennium B.C.

Conspicuous evidence of Elamite civilization was to be seen in the Malamir basin farther north. The rock sculptures and cuneiform inscriptions found in the large grottoes of Shikaft-i-Salman and elsewhere had been first examined by Sir Henry Layard and made later the subject of expert study. But apart from visits to these remains there awaited me at Malamir an important recent discovery. At the house of the capable military administrator of the district I found to my surprise and delight a carefully cast bronze statue of a male figure, 6 feet 4 inches in height, wearing on the head a diadem-like band, and suspended from a waist-belt, sword and dagger (Plate 10). While the dress of the figure was Iranian, as also the arrangement of the hair, the excellently modelled head showed unmistakably the influence of Hellenistic art. The features of the face curiously recalled those represented in certain Graeco-Buddhist sculptures of Gandhara. From the same find came fragments of smaller bronze figures and two marble heads. One wears the royal diadem and the other, badly damaged, is that of a Hellenistic type of Aphrodite, like that found by me in 1934 at Fasa. All these sculptural remains could clearly be recognized as dating from Parthian times, the least-known period in the history of Iranian art.

I was naturally anxious to examine the place of this remarkable find. It was reported to have been made some six months before in the valley of Shami. But before setting out for it to the north-west we succeeded, by a short trial excavation at a small mound, in recovering a quantity of interesting painted pottery. This definitely proves that the well-watered Malamir basin holds remains of a chalcolithic settlement. From our route to Shami I diverged to the Karun river valley for a rapid visit to Susan, where Rawlinson had heard of ancient remains. They proved to consist only of extensive but shapeless stone heaps stretching on terraces for a mile above the right river bank. The importance which this small but naturally fertile tract had once enjoyed is attested by the paved bridle path, obviously ancient and skilfully engineered

(Scale ½)

9. *Mask from head of bronze statue from Shami*

10. *Bronze statue from Shami*

11. *Rock-cut relievo, Tang-i-Sarvak valley*

12. Crossing the Saimareh river

13. Ruined bridge over the Saimareh below Hulailan

14. Ruined bridge over the Kashgan river

along steep spurs falling off to the river, and by the remains of a Sasanian bridge once spanning the river where it is confined to a cliff-bound bed some 50 yards wide.

Retracing from Susan part of our route and then crossing a low pass to the north, we reached Shami by January 27. There in the steep but fairly open valley known by that name we were shown the spot where the bronzes had been discovered. It lay at an elevation of about 3600 feet on one of the terraces which stretch down from a rugged high mountain on the west and offer some ground for cultivation. A short while ago an order had gone forth here to the scattered camps of still semi-nomadic Bakhtiaris that all claiming arable land should settle down near it in permanent habitations. So one of the Shami people had started to build himself a dwelling with the rough stones plentifully lying about on that terrace. In digging down for a foundation wall he had struck the bronze statue seen at Malamir at a depth of a couple of feet. After a day's digging done in the presence of the district officer had brought to light the fragments of sculptures also removed to Malamir, the place of the find had been left undisturbed under administrative orders.

A week of steady excavation now allowed me systematically to clear the whole of the low mound from the south-western corner of which the sculptural remains had been recovered. It proved to mark the site of a quadrangular temple, measuring about 76 by 40 feet, which had been destroyed by fire and sacked. Subsequently its walls had been levelled to the ground to provide space for some later structure. But the foundations of the walls could still be traced, and in the centre of the quadrangle an altar built with burnt bricks and approached over a brick pavement had survived.

There was only too clear evidence that this site, dating from Parthian times, had after its first destruction been greatly disturbed by quarrying operations for metal and other useful materials. This was proved by the disturbed position of six massive stone bases which had once carried statues. On some of the bases there were sunk sockets for the feet of more than one figure. Among the numerous broken pieces from bronze images, all cast and clearly showing in their modelling the influence of Hellenistic art, there were several which had belonged to statues over life-size.

The most striking of these remains are pieces of a fine male head, obviously smashed with violence. The two halves of a well-executed mask can fortunately be fitted together and show a face in a distinctly naturalistic treatment of Hellenistic style (Plate 9). A third piece found close by shows the back perhaps belonging to the same head. The diadem tied over the locks indicates that a royal personage is represented. Worship of kings deified is well attested among Alexander's successors in the Near East, and expert examination of the head, when the portions have been properly joined up and cleaned, may yet lead to the identification of the king to whom the image was dedicated.

Among the fragments recovered from other bronze statues I may mention a carefully modelled colossal hand which, by the pose of the fingers and wrist, suggests that of a divinity holding a sceptre or spear. Besides other sculptural fragments, we recovered a miniature altar of marble, delicately carved; pieces worked in *repoussé* of two ornamental candelabras of copper, perhaps for burning incense; the elegantly designed bronze foot of a chair or table

representing the foot of a lion; and a sheathed steel dagger. A small copper coin from the mint of some Greek town in Mesopotamia afforded a welcome indication of the approximate date when the shrine was still visited.

There remains the puzzling question as to how a locality so restricted in space and resources as this outlying valley of Shami is, could afford a temple so amply provided with objects of Hellenistic-Iranian worship. It is hard to assume that objects of such size and weight as a colossal bronze statue could have been brought from any great distance to a place surrounded by rugged mountains. On the other hand, if it was cast here, what highly developed cultural and economic conditions it presupposes for such a locality. A thorough exploration of certain ruins just traceable below the surface of cultivated terraces lower down might perhaps yet help to answer such questions. But even without this there is reason to feel grateful for the light thrown by the finds of Shami on a fascinating but as yet very scantily documented phase of art in Iran.

Early in February I found it necessary to get into contact with the authorities at Ahwaz, the headquarters of the Khuzistan province. The journey there was greatly facilitated by the effective help and hospitable attention accorded by the management and staff of the Anglo-Iranian Oil Company. A two days' halt at the great oilfields of Maidan-i-Naftun left me deeply impressed with all that British industrial enterprise and engineering skill had by systematic planning and organization succeeded in creating in the face of exceptional difficulties both physical and otherwise.

Short as my stay at Maidan-i-Naftun was it could be utilized also for visits to two sites of archaeological interest. One of them was the huge platform, built with large slabs of freestone on a rocky hillock and known as the "Mosque of Solomon." It suggested at first a praying platform as used for Muhammadan worship, and a tomb of later construction at one end attests the continued sanctity of the site. But as jets of fire fed by gas escaping from the underlying oil-bearing strata were always known in the immediate neighbourhood it is highly probably that the site served Zoroastrian worship in connection with pilgrimages to the sacred fire, "self-crested" as the traditional term in Kashmir would have it. This accounts for the abundance of Parthian and Sasanian coins picked up after rainfall on the hillock.

Hospitably received by Mr. A. E. Watkinson, the British Consul, I was able at Ahwaz to secure the ready help of the experienced and enlightened General Mo'ini, commanding the forces in Khuzistan and Luristan, for a fresh escort and other needful arrangements to facilitate our prolonged journey ahead.

From Dizful, or rather Salahabad, the present rail head in its vicinity, our journey through the western and northern portion of Luristan was to start. On the way I paid a brief visit to the great site of ancient Susa. Ever since the days of MM. Dieulefoy and de Morgan extensive and systematic excavations had been carried on there on behalf of the Louvre under the patronage of the French Government. For fully half a century they have yielded a rich harvest of important discoveries. The hospitable welcome and expert guidance of M. le comte de Mecquenem, the present head of the Mission de Suse, made this visit both enjoyable and very instructive.

The route chosen after my caravan had rejoined me at Dizful took me first to Pa-i-pul. There the remains of an ancient bridge and barrage, much broken and showing later repairs, are to be seen thrown across the wide bed of the Karkheh river which drains most of Luristan and the Kermanshah province. Above it lie the heads of old canals which once had served to irrigate a portion of northern Susiana, now mostly abandoned to scrubby desert. The Karkheh, quite a considerable river, proved unfordable at this season and no skin rafts could be obtained anywhere along it. So instead of crossing the river we struck north, and in the course of three marches leading across difficult and previously unsurveyed ground through a maze of deeply eroded winding gorges, reached the point where the Karkheh turns round the south-eastern extremity of the high and rugged Kabir-koh range. The long winding valley of the river, known as Saimareh from here onwards, was to see us for close on two months.

From above the confluence with the mountain stream of the Ab-i-Zal we had to follow the left bank for several marches. The river has here cut its tortuous bed in such deep and extremely narrow ravines as to be practically invisible from the modern motor road engineered along it towards Khurram-abad. But turning off from this for a short distance I was able to visit the point known as Pul-i-tang, where the rock-lined bed is so narrow that a jump right across it from ledge to ledge could be risked by lithe-limbed Lurs from bravado, as Sir Henry Rawlinson witnessed.

This newly built motor road is the only route practicable for mechanized transport between Tehran and the head of the Persian Gulf, and the heavy traffic met along it showed its importance. But it was of interest also because, in conjunction with effective military operations of recent years, it has been mainly instrumental in reducing to order the congeries of turbulent tribes ever given to plundering or at feud with each other in this northern or Pish-i-koh portion of Luristan. Among the measures adopted by the present strong regime to assure peace and security for traffic has been the forcible settlement of the nomadic Lurs in fixed habitations. The exceedingly primitive look of these as seen along the new high road and elsewhere illustrated the novelty of the change thus enforced.

That this change, so beneficent on the whole, must involve serious hardships for a considerable proportion of the *quondam* nomadic tribal population can scarcely be doubted; for many of those who were accustomed to seek warmth in the lower valleys or in the plains of Khuzistan during the winter months and to migrate with their flocks to high ground in the mountains for the rest of the year, are now forced to face climatic extremes in one form or another for which they have not been prepared by the experience of former generations.

Yet just where we diverged from the modern high road in the small open plain of Jaidar there was striking evidence to be seen that this region had in earlier times also known trade and traffic presupposing more settled conditions of life. Where the Kashgan river, an important tributary of the Saimareh, emerges from a succession of difficult defiles it is spanned by the remains of a bridge imposing enough even in its state of complete ruin (Plate 14). The single arch and pier on the left bank still rise to close on 70 feet. But of the

intermediate pier which appears to have carried the two arches stretching across the actual river bed only huge compacted masses of cemented masonry emerge from the tossing water. On the right bank, inaccessible at the time owing to the flooded state of the river, the piers once carrying the arches of approach conveyed an impression both of their solid construction and of the force of the floods which had undermined and completely overturned some of them.

This noble structure, known as *Pul-i-dukhtar* or the "Bridge of the princess," probably dates from early Muhammadan times. Confirmation of this approximate dating is afforded by the remnant, scanty as it is, of a much earlier bridge to be seen a short distance lower down on the right bank. There the facing of what is left of a pier immediately by the river bank is formed by much larger blocks of stone set in uniform courses and once tied together by metal clamps. This is a method of construction manifestly pre-Sasanian.

From Jaidar two short marches to the south across a belt of a low gypsum hillocks and intervening ravines brought us down to where the valley of the Saimareh widens out into a more open stretch of alluvial ground at the foot of the Kabir-koh. A medieval bridge repeatedly repaired spanned the river where it contracts to about 25 yards between limestone rocks a short distance below its junction with the Kashgan. Its central arch has fallen since Rawlinson crossed it in 1836. Lower down there could be seen scanty remains of piers of two earlier bridges, and with materials quarried from them probably much of the bridge still standing in its ruins had been built.

Our crossing had to be effected by means of a single small raft made up of a dozen goat skins with a "deck" of reed bundles (Plate 12). As the raft could not carry more than three mule trunks besides a single passenger at a time, the ferrying of our whole camp, including the escort, took nearly a whole day. The Saimareh, unfordable during winter and spring, had to be crossed seven times more in this way. The ups and downs of civilization are aptly illustrated by the fact that Luristan nowadays does not know the art of the potter. Its people are content to drink from skin bags, and the same bags when inflated had to be used for crossing the river. Only on one occasion was it possible to collect a number of bags sufficient for more than a single frail raft.

After crossing the Saimareh to the right bank we moved up the gradually widening alluvial valley bottom along the foot of the rugged Kabir-koh. Cultivation of this naturally fertile ground is facilitated by the ample supply of water for irrigation brought down by small streams from the range. The denser population in historical times of this tract, known to early Arab geographers by the name of Mihrijan or Saimara, is attested at several places by structural remains of small towns. At the mouth of a picturesque side valley the site of the chief place is marked by the extensive ruins of Dara-shahr. The town was much reduced after a terrible earthquake in A.D. 871, but is known to have been occupied down to the twelfth century. Yet some of the less decayed ruins suggested that their structural features had not essentially changed from those of Sasanian times.

At two conspicuous mounds rising above the alluvial riverine plain short trial excavations brought to light definite evidence of prolonged prehistoric

occupation, in the shape of painted pottery of chalcolithic type and engraved stone seals. But easier and far more profitable was the exploration of such remains on the narrow crest of a clay ridge which rises among eroded plateau tongues to a height of some 120 feet above the patches of flat ground between them. The spot is known as *Kazagaran*, the "potters' place." The convex slope of the ridge proved to be littered on its bare surface with ancient potsherds. Among them were numerous fragments bearing neatly executed monochrome designs, familiar to me from previous explorations in southern Persia. They had all been washed down from the debris layers of a small chalcolithic settlement extending for about a hundred yards along the top of the ridge and gradually eroded. The very steep slope on the concave side of the ridge facilitated the removal of the earth excavated, and thus allowed us to clear the ground quickly down to the original level. The excavation yielded a great quantity of painted ware with interesting designs including animal figures, all manifestly of the same chalcolithic period, besides engraved button seals, terracotta figurines, stone implements, etc. Below the stratum marking occupation there came to light a number of large pots containing bone fragments from fractional burials, as well as some funerary furniture.

A day's halt on the left bank of the river was enforced by regard for the Persian New Year, March 21. This allowed me to examine closely the remains of a ruined bridge, known as *Pul-i-ab-burdeh*, the "Bridge broken by the water," and presenting a quasi-geographical interest. To my surprise I found that the twelve piers of the bridge, which together with the arches between them, all fallen, extend over a total distance of some 270 yards, are now separated by fully one-third of a mile from the river, which sweeps past in a huge bend under high cliffs of clay to the south. The piers, all much broken, have their bases and buttresses almost completely covered by alluvium. It was obvious that before the river had changed its course and left the bridge high and dry, this must have been exposed for a long time to the force of heavy floods.

Judging from certain structural features the bridge seemed to date from Sasanian times; but there was nothing to indicate when its destruction had started. The change of the river bed is likely to have taken place a considerable time after this. It was all the more curious to observe that the left bank of the river, as shown by careful levelling, now lies fully 40 feet lower than the ground above which the piers of the present bridge rise. The difference between these levels helps to convey some idea of the heavy alluvium which the Saimareh carries down when in flood. To this process continued over a much earlier geological period is obviously due the formation of the high plateau of reddish clay which extends here all along the right bank of the river and faces the beds of limestone or gypsum on the left.

The present position of the ruined bridge acquires a certain chronological interest from a notice to be found in the great geographical compilation of Yaqut (*circ.* A.D. 1200). This mentions a "wonderful and peculiar bridge between Saimara and Tarhan" and ascribes to it a length half the length of a famous bridge at Khanaqin. As the latter counted twenty-four arches, just twice as many as are still counted at the Pul-i-ab-burdeh, and as Tarhan is the name of the tract immediately to the north of this portion of the Saimareh

valley, it is certain that Yaqut's notice refers to the ruined bridge just described. If it was still used in his time for crossing the river, as the quotation from his text accessible to me in Professor Schwarz's 'Iran im Mittelalter' seems to imply, we are supplied here with a useful gauge of the time taken by the two-fold process which gradually filled up the old bed with deposits of alluvium and then forced the river to seek a new one by cutting its winding course into the high clay cliffs which face the plateau of the valley trough to the south. Remains of a small ruined stronghold, situated on the top of a detached gypsum ridge above the left river bank some distance higher up proved to date from Sasanian times. They too afforded interesting evidence as to the change which the bed of the river has since undergone.

During the last week or so the weather down by the Saimareh had been growing distinctly warmer. So I felt glad when I could turn from it northward. There in the open Rumishkan valley, the south-eastern portion of the Tarhan tract, M. de Morgan had already at the close of the last century noted some mounds with painted pottery dating from early chalcolithic times. From a rapid visit which Dr. Schmidt of the Chicago University Archaeological Institute had paid me at Shiraz when on his way by aeroplane from Rumishkan to Persepolis, I knew that his party had been carrying on excavations at the former place for some months and with good results. A two days' extensive survey of the whole ground showed that the exploration of the two small mounds which had been the scene of these systematic labours was still far from being completed, and that there were others, too, of larger size awaiting investigation.

Respect was due on our part for our American confrères' claim, and precluded excavation on this ground. But the inspection of its surface remains sufficed to bring out a fact of distinct antiquarian and geographical interest. Evidence of prehistoric occupation was noted at both ends of the long Rumishkan valley. Yet nowhere does this hold running water on its fertile surface, and cultivation is carried on only with the help of the winter rainfall. These conditions differ in a significant way from my observations in other parts of southern Iran as regards settled occupation in prehistoric times. There evidence of this is confined solely to where surface water is available for irrigation of cultivable ground. It may hence be safely concluded that in prehistoric times the annual rainfall in Luristan must have been larger, just as it now is, than in the regions farther to the east.

In the much more extensive valley of Tarhan proper, into which we next moved across a comparatively low range of limestone hills to the north-west, no evidence of pre-historic occupation was traced. This negative result is all the more curious as two small streams descending from the higher range to the north provide irrigation for some portion of the cultivated area. On the slopes of several low mounds numerous cairn-marked graves attracted attention. Almost all proved to have been opened in recent years, showing the extent to which the search for "Luristan bronzes" on behalf of the antique dealers of Kermanshah had been carried. Of any finds made the local Lurs professed to be ignorant. Of the methods followed by those engaged in the search we were to learn significant details as our further tour brought us nearer to the ground where this destructive exploitation had started.

But before this I was anxious to regain the Saimareh in the Rudbar tract to the south-west. It had remained so far unsurveyed. Both above and below it the river has cut its way for a considerable distance through winding gorges quite impassable even on foot during the greater part of the year. The ruins of the "town of Rudbar" of which Rawlinson had heard just a hundred years ago proved insignificant. But when, after crossing the Saimareh again to the right bank, I proceeded up the side valley of the "stream of Shirwan" it was of interest to compare the present condition of this amply watered and naturally fertile tract with the glowing picture presented of it in the accounts of early Arab travellers and geographers. They knew it by the ancient name of *Masabadan*. The fresh green of the fields was refreshing to the eyes and even more the long-missed view of trees growing here and there in clumps on the slopes. They were mostly small oak trees of considerable age which had somehow escaped the omnivorous goats and the equally destructive nomadic Lurs. But only a few mulberry trees survived to recall the fine orchards described in those early accounts.

The decay and ruin which had overtaken this ground favoured by nature was brought out clearly by the contrast between the reed huts and mud hovels of the recently settled hamlets and the ruins of the "town of Sirwan" as the old Arab writers call it. They stretch for close on a mile along the slope of a steep spur up to where at the head of a narrow valley a fine stream issues from springs. From the accumulation of debris there emerge the openings of row upon row of vaulted rooms and passages, all that remains exposed of houses massively built in tiers, with walls of rough stones and hard mortar. The shape of the vaults pointed distinctly to Sasanian or early Arab construction.

The ruin of a large but completely collapsed structure in the centre was undoubtedly what had been pointed out to Rawlinson as the tomb of King Anushirwan and an object of fanciful legends. A great cutting had been laboriously carried deep down into the consolidated mass of hard debris by a party from Kermanshah digging for "treasure" under a concession from Tehran. This made it possible to determine that the plan of this considerable building probably comprised a central domed hall within concentric squares of apartments and passages. It thus corresponded closely to that of the ruined Sasanian mansion surveyed by us at Chahar-deh on the way to Do-gumbadan.

On this ground, which with the rest of the Saimareh valley lower down is reckoned as part of the *garm-sir* or hot region, the heat of the day had already made itself distinctly felt. All the more I appreciated the cool air of the well-wooded ranges rising at points to more than 6000 feet across which our route farther north led. They form part of the *yailaks* or summer grazing grounds to which Lur tribal sections were accustomed to move with their flocks and cattle in the spring, to remain there till the early autumn. Now all the Lurs have had to give up their "black tents" which served as movable homes and to settle down in clusters of mud hovels built near their fields. That these far from hygienic abodes become by the end of the cold weather uninhabitable for a time owing to insects and vermin is a minor drawback, noticed again and again.

On our way to Hulailan it became possible to map the picturesque tortuous gorges previously unsurveyed in which the river has cut its passage through

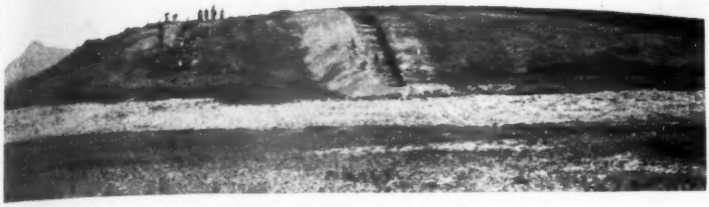
successive ranges. Evidence of the traffic once linking Tarhan with the great valleys towards Kermanshah was afforded by the ruin of a bold bridge spanning the river below Hulailan (Plate 13). This fertile tract on both sides of the river farther up had been for years one of the hunting grounds for those "Luristan bronzes" which Lur tribesmen used to supply to antique dealers at Kermanshah. Subsequently clever forgers helped also to flood the market for collectors and museums in the West.

Close study of the many fine genuine specimens had led competent antiquaries such as Monsieur A. Godard, the Director of the Service Archéologique d'Iran, to conclude that these bronzes were all derived from the funerary furniture of burials which probably belonged to a population closely related to the Kossite invaders of Babylonia. But in the absence of direct observation as regards the circumstances of these finds, no definite evidence as regards their chronology was available.

Examination of two extensive burial grounds in Hulailan sufficed to show how thoroughly these Lur searchers had rifled all graves likely to hold bronzes. Experience had shown them that such were to be looked for only where large slabs of stone had been carefully placed over the grave cavities (Plate 17). Of such graves they soon learned to make sure by probing the covering soil, nowhere deep, with skewers. The traditional Lur love of plunder added to the zest excited by the high prices paid for more elaborate bronze pieces. Ceramic ware holding funerary deposits, or anything else not marketable dug up from the graves, was destroyed or left behind.

Close examination of the broken pottery found near such rifled graves showed that these graves were approximately coeval with the burials which a systematic trial excavation carried out by us at the large mound of Kazabad near the western end of Hulailan cultivation brought to light. Here, on the slope of ground bearing remains of permanent occupation towards the close of the Bronze Age, there were found complete bodies stretched out or in a crouching position, as well as fractional burials from bodies previously exposed to birds and beasts of prey. The large pots containing the latter corresponded in type to the ceramic ware found near the rifled graves. Among the objects we recovered near the complete bodies there were iron bangles, anklets, needle, and knife, besides miscellaneous articles in bronze such as pins, figurines, and cups. Judging from these finds it seemed difficult to ascribe these Hulailan burials and the Luristan bronzes plundered from the approximately coeval graves to a period much earlier than the beginning of the first millennium B.C.

Spring had advanced with us ever since we entered Luristan. Decking with beautiful flowers the short-lived verdure of the valleys it provided a constant feast for the eyes. Now that we turned north-eastwards to higher ground *primavera* could still accompany us. Two delightful marches along a range clad with plentiful oak forest at elevations between 5000 and 6000 feet brought us to the wide trough-like valley of Koh-i-dasht. Owing to its central position Koh-i-dasht had served as a favourite base for a succession of Lur chiefs who, helped by tribal feuds and intrigues, used at times to dominate Pish-i-koh or the northern portion of Luristan. The last of them, Nazar 'Ali Khan, had rivalled in power the Wali of Pusht-i-koh in the south and repeatedly



15. Chigha-pahan mound, Koh-i-dasht

16. Tang-i-Gaushumar gorge, Kashgan river

17. Luristan grave at Chigha-barinda, Tarhan

18. Early Muhammadan bridge at Samaq, over Kashgan river

19. Rock-cut wall above spring, Harsin

fought him. No wonder that Koh-i-dasht had suffered much from the exactions of its tribal chiefs and in spite of its wide expanse of arable ground had become sadly depopulated. Nazar 'Ali's son, 'Ali Muhammad Khan, had about eight years before headed the last serious rising in Luristan. He had held a force of regular troops sent against him at bay for a month, at a hill pointed out to me on the eastern edge of Koh-i-dasht, before he made his submission to become a state prisoner at Tehran.

We found Aman-ullah Khan, a cousin whose father had been murdered by the old chief, now installed as local administrator, but with duly limited powers. The useful local information he willingly supplied enabled me to examine on two long reconnaissance rides all old sites within the wide basin drained by the Madiun-rud. Among them was an extensive area where a multitude of graves was seen scattered around an enclosure marked by roughly built and much decayed stone walls. All the graves proved to have been thoroughly burrowed into for bronzes. The plentiful debris of large pots found near the graves showed the same types of decoration as observed at the graveyards of Hulailan.

To the east of the deep-cut bed in which the Madiun-rud gathers its waters from springs fed by subterraneous drainage there rises a mound measuring fully a mile in circumference and justly known as *Chigha-pahan*, "the big mound" (Plate 15). The greatest portion of it was found to be covered with luxuriant crops of wheat and barley, proof of the fertility of the soil produced by deposits in the course of long-continued human occupation. But at the western extremity, where the slope was too steep for tillage, it was easy to pick up on the surface fragments of early painted pottery and worked flints. The trial excavation which kept us hard at work here for four days yielded a considerable quantity of early chalcolithic pottery, including both painted and superior plain ware resembling terracotta in fineness of texture. Apart from a great variety of neatly executed geometrical patterns, interesting fragments with animal designs closely recalling those found by me at chalcolithic sites in Fars were recovered. Associated with these ceramic remains were a variety of miscellaneous small objects in bronze, bone, and stone.

To an observation of distinct geographical interest only the briefest reference can be made here. A careful survey of the mound showed that it occupies the angle between two fairly broad beds now completely dry. That these beds had at one time held running water could have been only conjectured from what the ground itself indicated. Reliable local information showed that these beds had carried a good deal of water from springs higher up in the valley until some twelve years ago, when these springs completely dried up. The change was ascribed to an earthquake which Koh-i-dasht had experienced about the same time. This, on the other hand, is held to have accounted for a notable increase in the volume of the springs some 3 miles away to the west which are now the main feeders of the Madiun-rud.

For the concluding portion of the season's work in Luristan the high-lying tracts of Alishtar and Delfan in the north had suggested themselves. The five marches which took us to Alishtar lay mainly up the narrow picturesque valley of the Kashgan river, and the first of them brought us to the imposing remains of a ruined bridge which once served traffic across it

(Plate 18). The two wide arches spanning the actual river bed had fallen, but the very massive pier between them still rose high above the flood. Of the nine arches on the right bank which served to give access to them, six could still be accurately measured. They proved to be 62 feet in height. The total length of the piers and arches measured on the right bank was not less than about 215 yards.

The interest presented by the structural features of the bridge, such as the shape of the arches, the stone facing of the piers, the layers of concrete within, etc., is much increased by an exactly dated inscription. It is engraved in fine Kufic characters on a large slab which we found lying on the ground near the end of the bridge on the right bank. According to the translation kindly supplied to me by Professor J. H. Kramers of Leiden, it records that the building of the bridge was ordered by Amir Abu'l-Najm Badr, a well-known Kurdish chief, in the year 389 (A.D. 999) and finished in 399 (A.D. 1008/9). Close comparison of the architectural details will help towards an approximate dating of other early bridges such as those mentioned at Jaidar, Brin, and Khairabad.

Farther up, where the river has cut its way in tortuous gorges through a main range, the track brought us to places where the mules even unladen could be taken only with difficulty up ledges of precipitous cliffs. At a point known as Tang-i-Gaushumar progress is possible only in the rock-bound bed of the river confined to about 30 yards between high wall-like ridges of limestone (Plate 16). But for an ancient causeway built for some distance along the foot of the cliffs the passage would be completely closed by the river during the greater part of the year. Though very massively constructed with large blocks of stone set in concrete the causeway has in places been nearly washed away.

Once beyond these gorges, progress became easy. On crossing a broad saddle the wide plateau of Alishtar stretching at elevations well above 5000 feet lay before us within a semicircle of mountains still bearing much snow. Apart from the fort of Mir 'Ali Khan, the last local chief of the Delfan tribes, which now serves as administrative headquarters for this fertile tract, Alishtar had until recent years seen only tribal summer camps from the side of Delfan. It is abundantly watered and now presented a wide expanse of verdant fields, sown with wheat or poppies for opium, and studded with newly built small hamlets. In a number of places these occupy the top of ancient mounds or have their dwellings partly dug into the slopes.

At Girairan, the largest of them, we found these modern quarters built below a mound measuring more than a mile in circumference, and rising on one side to fully 50 feet. Judging from its size and the abundant surface finds of ancient potsherds it appeared to mark the principal settlement of Alishtar during prehistoric times. But there was evidence of its having also been occupied intermittently down to the later Muhammadan period. Trial excavations in two trenches which plentiful and willing labour made possible, in spite of repeated downpours, yielded interesting painted pottery remains with geometrical and animal designs pointing to late chalcolithic times, besides small objects in bronze and stone. A complete burial was found intact, comprising a varied assortment of vessels to hold funerary food deposits as well

as objects of daily use such as a bronze knife and cup. Occupation of the highest portion of the mound in medieval times was proved by pieces of fine glazed ware found there.

From Alishtar we made our way north-westwards along the foot of the high range which divides Luristan from Nihavand and Kangavar, well-known districts of ancient Media. The open valleys of Khava and Khavari, stretching at elevations between 6000 and 7000 feet, had, like the rest of this northern portion of Pish-i-koh, remained previously unsurveyed. There a number of old mounds could be traced. The ceramic and other remains brought to light by short trial excavations at two of them proved that on this elevated ground, too, settled life had existed since about the same early period as at Girairan. At a mound rising where the drainage of those valleys descends into the defile of Badavar a number of burial deposits yielded interesting relics. Among them were engraved cylinder seals used as part of a necklace and betokening Mesopotamian influence, and large bronze rings. These latter, far too heavy for wear, were probably meant to serve as currency.

Our subsequent passage westwards lay through some of the high valleys of Delfan. The burial sites there traced had not escaped the attention of those who for years had eagerly scoured these parts for "Luristan bronzes." The fact of their being situated far away from cultivable ground pointed to those who had deposited their dead there having followed a semi-nomadic life, just as the tribes now claiming possession of Delfan did until quite recently. There is good reason to believe that these valleys, admirably adapted for grazing, were included in the region which served as the breeding ground for the Nysaean horses of the Achaemenian dynasty. Alexander is said to have visited them on his way from Opis to Media.

Our journey had now brought us to where the extreme north-western part of Luristan adjoins Harsin, one of the old settled tracts of the Kermanshah province. Before entering it the opportunity was used to test the stratification of a small but high mound rising above the fine spring and newly built hamlet of Telyab. A short trial trench confirmed the conclusion drawn from surface finds, such as Seleucidian copper coins, that occupation had continued here from late chalcolithic well into historical times. Incidentally there was found here a curious *cache* of a complete set of iron ploughing implements on a level distinctly pre-Muhammadan.

After fully three months of travel in parts which the disturbed conditions of many centuries have left bare of all amenities, it was delightful to come to the small town of Harsin ensconced among luxuriant orchards and groves of old plane trees. The life-giving water of the canals irrigating these is derived from a single magnificent spring gushing forth under high limestone cliffs at the foot of a bare hill range. A wide portion of the rock wall had been cut and smoothed down as if for a large relievo sculpture or inscription; but the work was never completed (Plate 19).

Kermanshah was reached on June 3. Here I was detained by an accumulation of clerical work for twelve days, spent under the hospitable roof of the British Consul, Mr. Charles R. Gault, before I could move into Persian Kurdistan. In its higher valleys I hoped to continue field work during the the summer months. Travelling by car and lorry on the well-made motor

road, we arrived at Senneh, the capital of the province previously known as Ardelan, on June 16. We found a pleasant camping place in the garden of Khusrawabad, an old mansion belonging to a once important local family.

Unforeseen difficulties over our proposed movements within the province were fortunately overcome through the kind interest taken by the Governor, H.E. Mirza Shahab-ud-dauleh, in my scientific aims. His effective help made it possible in the end to secure the needful gendarmerie escort for at least a portion of my programme. So after a fortnight's delay I set out by July 2 for my immediate goal, the caves of Karafto.

My attention had first been called to this interesting site by Dr. W. Tarn. The mention of a Herakles in a Greek inscription imperfectly copied there in 1816 by Sir Ker Porter had suggested to that eminent scholar the possibility of the caves being somehow connected with a shrine of Herakles to which Tacitus refers in his account of the campaign of the pretender Mihirdates, supported by the Romans against the Parthians (*Annals*, xii, 13), and which so far had not been satisfactorily located. The passage mentions Mount Sanbulos as the place where Gotarzes, the Arsacid king, while awaiting the attack, was seeking divine oracles, in particular from Herakles. Three marches, mainly by the high road, brought us to Diwandarra, where our escort was suitably strengthened by some Kurdish men-at-arms. Then we turned off to the north-east and after three more marches over airy plateaux at heights close on 7000 feet reached the caves.

Partly natural and partly carved by the hand of man, they are now accessible only with difficulty by climbing up the face of a precipitous rock wall with which a great ridge of limestone breaks off towards a lonely valley (Plate 20). A careful survey made of the caves in the course of three days showed that apart from a high natural cavern, partially lit from a long gallery opening wide on the vertical face of the cliffs, there are a series of large apartments and passages cut through the rock and disposed in three stories. Above the entrance to the highest flight of rooms, airy and well lit, which would have well served as a comfortable place of residence, I found the Greek inscription rather carelessly engraved as Sir Ker Porter had seen it (Plate 21). Estampages taken of it have definitely confirmed the reading of it conjecturally proposed before by Professor A. Wilhelm. The well-known formula which the inscription contains and couples with the name of Herakles leaves no doubt about his being the divinity to which the locality was considered sacred.

Now the passage of Tacitus above mentioned relates a curious local legend attaching to the shrine at which Herakles was worshipped on Mount Sanbulos. According to this the god was believed to hunt on horseback at night and to be provided for this purpose by the priests at stated times with saddled horses which carried arrows in quivers ready for his use. Then when the horses with empty quivers had returned to the shrine in the morning, the victims of the god's nocturnal hunting would be collected by the priests on searching the woods. In the light of this legend it is easy to recognize the significance of a sgraffito rudely cut over part of the inscription and representing a horseman. Together with similar sgraffiti found on the smoke-begrimed rock walls of the room behind the entrance, it affords clear proof that the Herakles

mentioned in the inscription is the divine horseman of whom the legend told.

I need not discuss here the question which particular Iranian divinity, probably Verethraghna, it was whom Greek-speaking visitors to the shrine identified with Herakles. That the inscription which mentions the god by this name is older than the time of the Roman campaign is made certain by the palaeographic character of the script, which points to the late fourth or early third century B.C. It is equally obvious that the great natural cavern, with its dim light and the several mysterious rifts opening at its back far into the mountain, would have admirably suited a sanctuary to be visited for divine oracles.

The description of those cavities in Sir Ker Porter's account was found generally correct, though tinged by a somewhat romantic disposition easily stirred by such a place. To me they recalled again and again the grottoes of the Sybil I had seen near Cumae. Only great sanctity enjoyed by the site through ages could account for the immense labour which the cutting of all the halls, passages, etc., must have involved. In order to ascertain the cult for which the deep natural cavities may have served perhaps since prehistoric times, it would be necessary systematically to clear the heavy accumulation of fine detritus, droppings of bats, etc., covering their floors, as well as to provide adequate lighting. Such protracted labour was precluded for me. But there was some compensation to be found in the evidence which subsequent topographical observation offered for the location of Mount Sanbulos at Karafto. The journey which took us thence westwards to the town of Sakiz lay along a regular caravan track forming the continuation of the most direct and convenient route which, leading through Iraqi Kurdistan and Sardasht, connects Arbil with the great plateaux of Zinjan and Hamadan in the centre of Media. We know that the campaign recorded by Tacitus started from Adiabene, the territory of which Mosul, corresponding to Nineveh, and Arbil, the ancient Arbela, have remained the chief centres since early times to this day.

The three marches which brought us down to Sakiz led through easy and well-cultivated valleys such as still see a fair amount of traffic and would have favoured invasion from the side of the Assyrian plain and across the upper course of the Little Zab. But though the intelligent officers in charge of the garrison at Sakiz gave us a very kindly welcome, I found access to Baneh and Sardasht in the tracts nearer to the border still barred. So I proceeded northward to Sauj-bulagh, the headquarters of a district included in the province of Urumia, now renamed Rizayeh. This comprises the tracts to the south and west of Lake Urumia.

Sauj-bulagh was the northernmost area included in my sanctioned programme, and it was my hope that here in the higher valleys towards the main Zagros range marking the Persō–'Iraq border we might find during August both comparative coolness and ancient sites to survey. On the Maidan pass by which on the last day of July we crossed into Paswa, the main valley of the tract known as Lajistan, we enjoyed at an elevation of about 6800 feet refreshing Alpine air. We little suspected at the time that the brisk shower which, unexpected at this season, added to this comforting coolness, meant a

cloudburst lower down. It destroyed a portion of Sauj-bulagh town with heavy loss of life, and would have swept away our camp where it had stood in the morning.

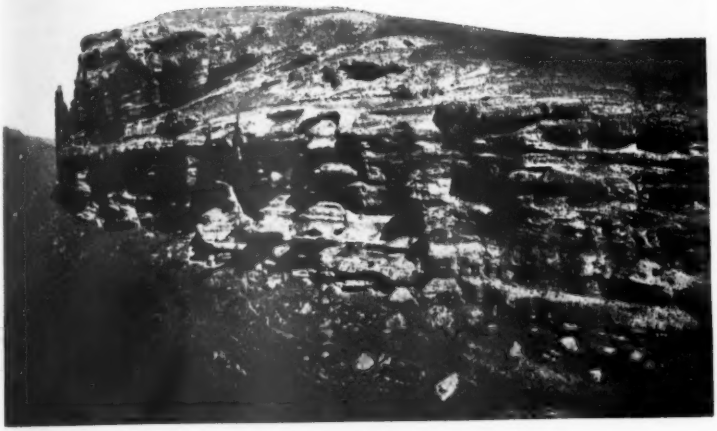
The pleasant open valleys of Lahijan are overlooked in the distance by peaks rising to close on 11,000 feet, still bearing snow at the time. They were once held by a leading clan of the Mukri Kurds. They proved to contain quite a number of small mounds where potsherds and worked flints picked up on the surface indicated early occupation. But owing to the ravages this fertile ground had suffered during the war through alternating invasions of Turks and Russians, it had become so badly depopulated that while harvesting was in progress it proved impossible to secure adequate labour for trial excavations.

The great mound of Paswa-qal'a, over 70 feet in height, on which the much-damaged fort of Karan Agha, the present chief of the Mukri tribe, stands, showed how densely this tract must have been inhabited down to historical times. This could be concluded also from examination of the remains of the early Muhammadan period found at the ruined hill fastness of Kitkan. This occupies a small rock-girt plateau, difficult of access, on the top of a conspicuous peak dominating the valley. As shown by the Russian mapping, which in these parts has been very careful, the rock pinnacle crowning the site rises to a height of close on 8000 feet. It offers a magnificent view all round, as far as the great expanse of Lake Urumia.

From Paswa a two-days' march carried us across a fairly low watershed into the wide and abundantly watered valley known as Ushnu or Ushnuviyeh in Kurdish, from its pleasantly situated little town. Here a large mound occupied on one side by the small hamlet of Dinkha had its northern flank cut into by erosion from the river skirting its foot (Plate 22). The steep bank thus exposed to a height of 32 feet above the river offered convenient scope for testing by trial excavation the layers of debris composing it. A week's digging carried out with an adequate number of sturdy and fairly intelligent Kurds was rewarded by ample finds. The ceramics included both painted ware with monochrome designs, mainly geometric, and in the upper layers a considerable proportion of well-made plain red and black pottery, often finely burnished and of a type not met with in Fars and Luristan.

Several intact burials with ample funerary furniture, found at depths varying from 17 to 23 feet below the top edge of the mound, proved to belong to the bronze age. Significantly enough there were represented among them three different burial customs. In a carefully built tomb covered with huge unhewn slabs of stone the complete but badly decayed body of a man was found in a seated position, along with a large collection of small jars and cups as well as bronze objects (Plate 23). The total absence of stone implements pointed to occupation not having started here much before the second millenium B.C.

Before leaving the Ushnu tract in the first week of September I was able to test the conclusions reached at Dinkha by a profitable excavation carried out at a small but conspicuous mound known as Gird-i-Hasan 'Ali. It rises not far from the point where the Gadar river draining Ushnu passes through a defile into the large plain of Solduz south of the Urumia lake. Here too



20. Rock face of ridge containing the Karafto caves

21. Greek inscription in the Karafto caves

22. Excavation proceeding on the flank of the mound at Dinkha

23. Bronze age tomb in the Dinkha mound

plenty of good plain pottery, black and red, was met with. But as the trial trench reached deeper strata, painted ware with neatly executed monochrome designs became increasingly frequent. The designs included bold representations of horned sheep as well as trees, highly stylized, all familiar from chalcolithic sites of Fars and farther east. The abundance throughout of worked stones, including fine obsidian blades, was striking; and a well-made bronze adze found at a depth of 15 feet left no doubt about the mound having been formed mainly by debris accumulating during prolonged occupation in chalcolithic times.

The district of Solduz to which we next turned eastwards was to mark the northernmost limit of the ground covered on my journey. It comprises a wide fertile plain watered by the Gadar river between the hill range of Lahijan in the south and the southern shores of the great salt lake of Urumia. The rich alluvial soil of the district is capable of supporting a considerable population, and a number of fairly large villages showed us that the Turki-speaking tribe of Kara-papak settled here since the beginning of the nineteenth century was well capable of developing the agricultural resources of the tract.

But there was on all sides only too much evidence of the ruin, resulting in famine and depopulation, which at first a short-lived Turkish invasion and then the much longer and equally destructive Russian occupation had wrought in Solduz. Thus at Naghadeh, the administrative headquarters of the district, which we visited first, we found the majority of the dwellings clustering round a great mound, pre-historic in origin, abandoned and in ruins. Of the extensive orchards once surrounding the place nothing was left, their trees having all been cut down for firewood. The construction of a light railway, which the Russians had begun to lay down from the lake and for which the earth work done could still be seen towards Lahijan, would not have afforded compensation for the destruction here entailed by the world war.

At most of the old mounds traced in Solduz in the course of reconnaissance rides the cover of vegetation, due to more ample moisture, rendered it difficult to diagnose the ages of the debris deposits from surface finds. Fortunately definite guidance was provided at the largest of the mounds by chance discoveries previously made there. It lies close to the considerable village of Hasanlu, some 7 miles to the north-east of Naghadeh and about the same distance from the lake shore, rising to a height of some 70 feet at one point and measuring fully a mile in circumference at its foot. On terrace-like ground beyond this villagers had come upon large pottery vessels, and these finds had led to burrowings by professional seekers of antiques.

After we had moved our camp to the site, a deep trial trench was cut down the slope of the mound where it faces the terrace. The strata disclosed proved to be composed of the debris of dwellings with plentiful and varied remains of a period when utensils of copper and bronze had completely superseded stone implements and when iron had only just come into use. Of particular interest were complete pottery vessels of varied shapes found in small kilns. Among them prevailed a highly burnished black or red ware with a very fine smooth surface.

The method for producing this fine surface was demonstrated by an assortment of hard pebbles which had been used as burnishers. These were

found lying on a small palette-like trough ready for use by the potter's hand. Interesting, too, as a relic from a metal worker's shop was a large jar holding dozens of roughly cast bronze rods which may have served as ingots. There, too, were found broken stone moulds for producing such ingots and broad chisel-like implements. A special interest attaches to a piece of hard-baked clay which evidently had served as a sealing round a stopper of wood since perished. It bears impressions from a cylinder seal which has been recognized on expert examination at the British Museum as of Mesopotamian workmanship and approximately of the fifteenth century B.C.

After the trial trench had been dug down to a depth sufficient to settle the character of the debris layers, a week more of our stay was devoted to the examination of the terrace where burials were to be looked for. Here the digging of two long trenches was soon rewarded by a succession of interesting grave finds. From a depth of some 6 feet downwards to close to where the natural soil was struck bodies were discovered buried in varying positions, but always provided with well-preserved funerary furniture. This comprised sets of vessels of varied shapes and skilful make, meant to hold food and drink for the use of the dead in another life. Of special interest in design and careful execution are large jars with curious elongated spouts, obviously intended to hold water. A closely similar shape is known among the Luristan bronzes.

The fabric of well-levigated clay, black, dark grey or red-slipped, clearly shows that all these ceramics were made for ordinary household use and not meant merely for funerary purposes. In most cases the surface is carefully burnished. Painted ware is but rarely represented and shows geometric designs in red and black where not confined to simple annular lines in monochrome. It seems doubtful whether this by the side of the prevalent plain but highly finished pottery could be considered a survival of the far more artistic ceramic technique of chalcolithic times, say, two thousand years earlier.

Apart from small children's remains placed in large pots, the bodies were found either laid out or in a crouching position. There was a certain uniformity in the character of the funerary furniture, though the number of vessels varied. This was still more the case as regards personal ornaments and belongings buried with the dead. They were frequent with the bodies of women, particularly in the shape of bronze rings, bracelets, pins, etc.

The richest deposit of this kind came to light in a grave some 12 feet below the surface. There the neck of a fairly tall woman was adorned with several necklaces made up of numerous beads of stone, copper, shell, frit, glass, and also a few of gold foil. A broad pendant-like plaque on the breast showed neat bands of copper beads mounted on a thin sheet of iron. But even heavier than this must have been an assortment more than a foot long of thin copper tubes, three tubes in each case being hinged together by means of small copper beads. When worn by the lady hanging over her breast this must have produced a pleasant musical tinkling whenever she moved.

The burial customs and deposits observed throughout at different depths had been so uniform in general character that even long-continued excavation over this wide area did not seem likely to disclose essential facts presenting novelty. So when the careful packing of all objects, including half a dozen

well-preserved skulls deserving of expert anthropological examination, had been done, I felt free to leave the site with a fair conscience. It had been an interesting but also a trying time. The heat of the days was scarcely abated by the violent gales, due to aspiration, which were blowing with rare interruptions from forenoon till evening. To keep one's eyes open was at times very difficult.

But this discomfort could not blind me to the interest of the wide view which the high position of our camp allowed me to enjoy in the early mornings. Apart from the high chain of the Zagros still within view above Ushnu there was a kind of fascination exercised by the scenery towards the great lake.

Before turning southward again I took the opportunity of extending my inspection of some neighbouring small mounds to the shore of that inland salt sea. As I looked across its wide utterly lifeless expanse from the barren coast, it was curious to feel that here at the northernmost limit of my journey I had been brought as it were within reach of Tabriz and the Caucasian regions.

The cold nights which set in suddenly with the end of summer served as a warning that it was time to regain Kermanshah and prepare for the proposed campaign in the autumn. As we passed back towards Sauj-bulagh I took occasion to visit from Qum-qal'a village the rock-cut cave tomb of Fakhrakah, first described by Sir Henry Rawlinson, and the extensive debris area of Shahr-i-Viran. The latter marks a ruined site of medieval times; but at some scattered mounds traced a short distance beyond it, known as Seh-gird, potsherds picked up on the surface clearly indicated prehistoric occupation. Owing to harvesting operations and some local obstruction it proved impossible to obtain labour for excavation without undue delay.

By September 27 we reached Sauj-bulagh and thence motor transport allowed us to regain Kermanshah after three days' travel. There the hospitable welcome accorded at the British Consulate by Mr. and Mrs. Vaughan Russell not merely afforded a very refreshing rest but helped me greatly to face the long and unforeseen delay which occurred over the arrangements needed for my journey onward to the Pusht-i-koh and along its foot to Khuzistan. Preparations for the expected visit of His Majesty the Shah on a tour of inspection fully absorbed the attention of all military and civil authorities of the province.

However, after His Majesty's tour through the province had safely terminated it became possible to secure the needful gendarmerie escort and to set out by October 21 on the proposed long journey. I was anxious, before turning to the Pusht-i-koh region, to gain some acquaintance with the tracts to the north of the ancient high road leading towards the Mesopotamian plains. So after reaching the wide valley of Mahidasht I spent the following week in making rapid surveys of the very numerous mounds scattered over considerable distances in that fertile tract. A number of them furnished evidence of prehistoric occupation.

Then turning to the south-west into the hills of Guran associated with Sir Henry Rawlinson's early political service in Persia, we were able in the neighbourhood of Gahwareh to examine high ground which so far had remained unmapped. Signs of incipient illness had affected my movements since leaving Kermanshah, and by the time we arrived at the interesting old town of Karind, situated on the ancient high road, and mentioned already

by that name in the Parthian itinerary of Isidorus of Charax, I was obliged to make a short halt. There telegraphic instructions issued from Tehran brought news that permission for travel in the Pusht-i-koh, named in my originally sanctioned programme as the final portion of my journey, had been withdrawn.

In consequence of this unforeseen obstacle I returned to Kermanshah by the high road, planning instead to continue work northward in the direction of Hamadan. A succession of marches allowed me there to visit the well-known remains of Behistun and Kangavar before illness obliged me to seek rest under the roof of the Hamadan Vice-Consulate, and to abandon any further attempt at field work. By December 7 I was able to start on my homeward journey, travelling by motor to Ahwaz and thence by steamer to Mohammerah. There I recovered fresh strength under the roof of Captain and Mrs. Bazalgette at the British Vice-Consulate and arranged for the shipping to London of the collection of antiquities which, under the generously granted permission of the Iranian Government, was to be temporarily deposited and examined at the British Museum. Finally by the third week of December I bade farewell to my faithful travel companions and took my leave from Iran. The happy memories of the years spent on its ancient soil will not be dimmed by whatever chances of fresh work may yet await me elsewhere.

EXPLORATION OF PORTUGUESE TIMOR

S. F. WITTOUCK

THE island of Timor is the largest of the Lesser Sunda Islands, which form the southernmost part of the East Indian Archipelago. It is bounded from the south-west to the north-east by the Savoe Sea, Ombay Strait, and Wetar Strait, which divide it from the arc of islands stretching eastwards from Java towards New Guinea. On the southern side it is separated from the Australian continent by the Timor Sea. The island is about 290 miles long and its greatest width is 62 miles. It extends from lat. 8° 19′ to 10° 27′ S. and from long. 123° 27′ to 127° 18′ E. of Greenwich, the general trend being SW.–NE.

The first Europeans to settle in Timor were the Portuguese, at the beginning of the sixteenth century, when the Portuguese colonial empire comprised, at least nominally, nearly all the south-eastern Asia and the Indonesian Archipelago. The first to come were Catholic missionaries, Dominican Fathers, who administered the island spiritually as well as temporally. Later, at the beginning of the seventeenth century, the Viceroy of Portuguese India, at last realizing the growing importance of the new colony, appointed a Governor, who took charge of the temporal affairs.

At the end of the sixteenth century started what may be called a "colonial war" between Portugal and the Netherlands, which, in spite of the re-establishment of peaceful relations between the two Powers in Europe, went on in the Malay Archipelago; a treaty was signed in 1661, but it did not settle the matter definitely. Finally, the two Powers realized the necessity of fixing definitely the boundaries of their respective possessions in the Archipelago. The negotiations were long and arduous; beginning in 1851, they were concluded on 20 April 1859, and a treaty was signed on that date at Lisbon. As far as Timor and its immediate dependencies were concerned, the Treaty of Lisbon gave to Portugal in Timor itself the north-western part, comprising the native states of Cava, Balibo, Lamakitu, Takay, Tatumia, Laukeu, Dacolo, Tamiru, and Suai, as well as the adjoining islands of Jaco, separated from the eastern point by a narrow strait, and Atauro, lying northwards from Timor. Furthermore, the outlying district of Oecussi, an enclave in the Dutch possessions, was given over to Portugal.

At present the border line between the Dutch and Portuguese territories in Timor runs as follows: from the mouth of Silaba river on the northern coast, along the Talao river down to its junction with the Male Baca river, the Male Baca river up to Mount Bulo, the Tiborok river up to Dato Miet Peak, the mountain range from Mount Fitun-Manu to Mount Kle Liut, and the Masin river which flows down to the south coast. These territories extend from lat. 8° 19′ to 9° 27′ S. and from long. 124° 57′ to 127° 18′ E., their length being about 170 miles and their greatest width 46 miles.

The capital of Portuguese Timor is Dilly, on the northern coast, residence of the Governor, and the colony is divided into one *concelho* and five *civil circumscriçoes* which are from west to east: Fronteira (Vila Armindo Monteiro),

Suro (Vila General Carmona), Manatuto (Vila de Manatuto), Sao Domingos (Vila Salazar), and Lautem (Vila Nova Malaca).

The native population of Portuguese Timor is about 500,000, and there is little known of its actual origins, and even less about the pre-European history of the island. The local traditions do not throw any light on the question, being very few and misty. There are doubtless close affinities between the Timorese and the New-Guinea and Australian populations, but there seems to be too a fairly strong Dravidian strain. Temperamentally, there is little of the fierce primitive about the Timorese, but much of the lack of stamina and indolence of the south Indian depressed tribes. In the eastern part of the island there is a slight Malayan admixture, but it is of very little importance. Physically the characteristics of the dominant type are a lanky frame, prominent bony structure, narrow chest and a large abdomen, even in adolescence. The skin is coarse, dark brown to black; the head is dolichocephalic, with fine hair, deep-set eyes, and a slack jaw. In short, a wiry rather than sturdy type, lacking in physical energy, a complete contrast in build, posture, and gait to the Mongoloid types of the northern part of the Archipelago. In spite of this lack of apparent physical strength and the profound ignorance of the most primitive hygiene, and the prevalence in consequence of malaria, dysentery, and various skin diseases, the Timorese show a surprising resistance to extremes of heat and cold, going almost naked to the highest altitude.

The Timorese do not seem to-day to have any tribal divisions, but a number of communities have been formed on the basis of language, the principal dialect being the *Tetun*. Though they all seem to derive from the same Indonesian and even Indian roots, there are marked differentiations. There are a few hereditary native kings (*regulos*) and a large number of lesser hereditary chiefs (*liurai*) who were probably sovereigns wielding supreme power, but who nowadays have become Government functionaries on a commission basis. Minor non-hereditary chiefs (*chefes de suco*) have been interposed by the Portuguese Government between the *liurais* and the common people.

Isolated farms rather than villages are the rule, although in the mountains one does find small communities grouped for defence within a rough stone enclosure. The staple crop is maize, and in eastern Timor there are to be found rice terraces. The people are generally undernourished and lacking in vitality, owing to their own laziness, cultivating barely enough maize to support themselves, although there is more than enough potential rice land.

The population is thicker on the barren northern coast and in the hills, the fertile south coast being almost uninhabited; this is said to be due partly to an epidemic occurring in the southern districts some twenty years ago, and partly to the migration following the abortive rebellion of 1912.

From the climatological point of view Timor may be divided in four zones: the hot and dry zone (northern coast), with an annual rainfall of 20 to 40 inches, mainly confined to the months from December till April, and a mean temperature of 80° F.; the hot and moist zone of the southern coast, with a rainfall from 65 to 110 inches, and a wet season ranging from November to July, the mean temperature being 75° F.; the intermediate zone of limestone plateaux and the mountain district up to 4000 feet, with a rainfall of 55 to

PORTUGUESE TIMOR
Ombay Strait
Wetar Strait
Timor Sea
Ataúro I.
Jaco
Vila Nova Malaca
LAUTEM
Vila Salazar
SÃO DOMINGOS
Viqueque
Alambata
Vila de Manatuto
MANATUTO
Laclubar
Soibada
Laleia R.
Sumasse R.
Mota Lecto R.
Solem R.
Clor R.
South Lacto R.
Dilly
DILLY
Vila General Carmona
Ermera
DISTRICT
Manufahi
Same
Aileu
Dare
Maubisse
Ainaro
Vila Arminio Monteiro
Lois R.
Balibo
Platcau
Fatu Maca R.
Baucau
Dare
Viqueque
Fatu Mean
Vila Lisbo
Marin R.
Silaka
DUTCH TIMOR
Miles
Heights in feet

110 inches from October to July, and a mean temperature of under 70° F.; the cold zone (above 4000 feet), to the highest altitudes of the Ramelau range (10,000 feet), with a more evenly distributed rainfall of about 130 inches. The highest shade temperatures recorded for Portuguese Timor are: 106° F. on the north coast, at Liquiça, on 5 November 1923, and 105° F. on the south coast, at Viqueque, on 26 December 1930. In the mountainous area, climatic conditions are apt to vary even with small changes of altitude and locality.

The natural Timorese flora is of the north Australian type, and there are two common types of forests, both Australian: *Casuarina equistifolia*, found in stony river-beds and on the mountain slopes below the 3000-foot level, and *Eucalyptus alba*, occurring in stunted form on the northern hills, and attaining much greater size in the south coast plains. There are also to be found sandalwood, mentioned by Camoens, and two species of bamboo.

The principal fauna of Timor, disregarding smaller animals and birds, include the wild buffalo, much dreaded by the natives, wild pig, deer, and the great flying fox. Birds are represented by hawks, various kinds of cacatoes, parroquet and pigeon, and jungle fowl. The island is comparatively free from smaller snakes, but the python is common in rocky uplands and attains a length of 25 feet. Sea-turtle and crocodile are to be found chiefly on the south coast.

Among the domestic animals, ponies are probably not indigenous but were introduced in the island before the arrival of the Portuguese; they rarely exceed 12 hands, and are used as a means of transportation on steep and narrow mountain tracks. Cattle are very scarce, and of little interest or value; domestic buffalo, a kindred species to the wild buffalo, is the same as seen anywhere else in the Archipelago. The most important native domestic animals are pigs, which form the principal domestic wealth of the Timorese, with whom they are a staple article of diet, beyond fulfilling a useful function as scavengers.

From the agricultural point of view, Timor may be divided into three zones. The dry and arid northern and eastern zone, with typical thorny vegetation and scrub jungle, may be dismissed at once as unsuitable for agriculture. With proper irrigation however the alluvial flats could be used for rice plantation. Elsewhere, the extreme permeability of the calcareous subsoil renders artificial irrigation impossible. The central mountain region, with steep grassy slopes, intersected with rocky upthrusts and occasional sparse forest, embraces not less than 1200 square miles. There are very few valleys containing any extent of fertile soil. In the vicinity of Ermera however one does find very good hill soils, highly suitable for coffee cultivation.

The only form of cultivation to be seen in those mountain wastes is sparse native food-crops, produced in quantities hardly sufficient for the needs of the hill population. The elevated plains of the middle section of the south coast are much more Malayan in character, and a complete contrast to the barren territories mentioned above, with a humid climate, heavier rainfall, and a more varied vegetation. From the agricultural point of view, these extensive grass plains contain nearly all the land suitable for further extensive development.

Besides the maize and rice already mentioned, susceptible of a much larger

extension, there are other agricultural products. In the first place comes coffee. Timorese coffee has a well-established reputation, and is in steady demand. But the production conditions are very poor, owing to the lack of technical experience: plantations are poorly shaded, unpruned and unweeded, infected with parasitic mosses, and the bulk of them are in a dying condition. As there is very little replanting in progress, a steady drop in production is anticipated.

Natives of Timor have been acquainted with tobacco since the seventeenth century, but no system of tobacco cultivation was known to them, and plantations were made simply in cleared forest patches, receiving no care except a little weeding during the growth of the plant. Native taste being rather rough, anything that burned was considered good enough. It seems however that with proper care fine imported species, Javanese and Filipino as well as Virginian tobacco, can give quite satisfactory results.

Among other crops susceptible of further development, one may mention camin, tea, capoc, abacca, oil palms, cotton, cacao, rubber, and copra.

Portuguese Timor may be divided into four areas topographically.

The north-western area includes the Concelho de Dilly, and a portion of the Circumscriçoes of Fronteira, Suro, and Manatuto; it is characterized by steep, rough mountains, running parallel to the north coast, showing only the early stage of erosional cycle; the main crest, following a general N. 80° E. trend, averages 2500 feet, and culminates at 4650 feet at the Fatu Masin. The range runs abruptly into the sea, west of vila de Manatuto, with a single gap, formed by the valley of the Comoro river, west of Dilly. The coastal range is characterized by intermittently watered, *V*-shaped river beds, a narrow coastal plain, steep narrow ridges, and more especially on the northern slope, a desert topography, and numerous and frequent exposures. The bed-rock consists chiefly of schists and meta-igneous rocks.

The central divide area is characterized by a definite mountain divide, with a complex system of spurs, often higher than the divide itself. It comprises portions of the Circumscriçoes of Fronteira, Suro, and Manatuto. Topographically, it is more mature than the north-west area, owing probably to the lower resistance of a great many of the rocks exposed, as well as to heavier rainfall. An abnormality in the otherwise very rugged features of this area, is the Balibo plateau, of a considerable extension, situated near the north-west coast, at an altitude of almost 1900 feet, separated from the main part of the central divide area by the broad, almost level Nunura plains.

The eastern area includes all the portion of the island east of Laleia and Sahem rivers, excepting the south coast area. It is characterized by three types of topography, widely scattered: the *fatu* (native name for a rock or group of rocks rising abruptly from more gently contoured hills) type, the plateau type, and the igneous rock type. The *fatu* type consists of long, flat-topped, steep-sided, limestone plateaux, heavily eroded; the general direction of these *fatu* mountains is SW.–NE. The plateaux type consists of low (about 1600 feet), flat or gently sloping limestones, sometimes with a typical karst topography. The igneous type belongs to a more youthful topography: sharp, saw-toothed ridges and peaks.

The south coast area (Fronteira, Suro, Manatuto, Sao Domingos) is a

zone of low running hills on the inner board and a typical flood plain area towards the sea. The streams coming out of the mountains have spread over a wide area, depositing their loads, and finally losing themselves in coastal swamps or sinking into gravels. The average width of this area does not exceed 4 miles.

Geologically, Timor belongs to the East Indian Archipelago, which lies at the intersection of two great zones of crustal weakness: the Alpine and the circum-Pacific orogenic systems. It is supposed that in pre-Permian times Timor was a part of a continental mass. At the close of the Carboniferous period, together with the greatest part, if not the totality, of the Archipelago Timor was submerged. This sinking of the land was accompanied by vulcanism, resulting in an extensive flow of basic material, and in the intrusion of igneous rocks into the older formations. It is supposed that the land remained submerged until the upper Jurrassic, and following a period of emergence, was submerged again. In the middle Tertiary a strong orogenic movement was directed from the central part of the Archipelago; the Timor row of islands facing the stable part of the Australian continent, suffered considerable squeezing, resulting in a complicated Alpine structure, with folding and overthrusting, accompanied by weak vulcanism. Since then extensive erosion has taken place, removing the greater part of the overthrust. Uplifting of the island has continued until the present day. From the detailed study of the geological conditions of Portuguese Timor one can easily see that the island as a result of the orogenic movements and igneous activity, providing a unique combination of geological and structural features, presents possibilities for mineral development.

As a remainder of the former volcanic activity, there are still many hot mineral springs containing enough minerals in solution to have a medicinal value.

The island is liberally supplied with building material, clay building stone, and extensive deposits of limestone. Coal occurs, but unfortunately one cannot expect the continuity of the located seams, owing to the extremely complicated geological structure, and on the other hand some of the deposits contain too much sulphur to have any value. Among other deposits there were lead (galena), copper, manganese, and chromite, some of the latter seeming to have a commercial value.

It was known long ago that Timor, and especially the Manufai district, possessed gold. Personal ornaments and other objects decorated with gold are found in many places in Timor, and it is reported that the wealthier native chiefs own large collections of gold plate. Further exploration proved that the Manufai District was the richest gold-bearing area. It is located in the central divide area, on its southern slopes, in the Circumscriçoes of Suro and Manatuto. The general topography of the Manufai district is rough, and in its northern part there are to be found mountains culminating at 9500 feet (Tata-Mailau). The structural data are imperfectly known; existing conditions are complex, owing to intense faulting and folding. The principal igneous rock predominating in the northern part of the district is a green diabase, which received the name of Manufai diabase. There are also to be found more recent igneous rocks. Sedimentary rocks are represented chiefly

The Kablak ridge in the central divide area

Northern coast of Timor on the road to Liquiça

Natives turning over the ground

Native village near Vila de Aviz

Natives of Timor

by shales, sometimes metamorphical and in schistose condition. Gold-bearing lodes were found in the northern part of the district, the veins being quartz, quartz-calcite, and calcite, the former containing sometimes free gold.

Placer mining has been carried on in a desultory fashion in the southern part of the district by natives. The Timorese method of washing gold is probably the most primitive in the world. It is done by placing in a ditch a piece of sandstone half an inch to $2\frac{1}{2}$ inches thick, 6 to 10 inches long, and 4 to 6 inches wide. A stream of water about $\frac{1}{2}$ inch deep is allowed to flow through the ditch and over the stone, which is placed so that it slopes slightly downstream. Gold-bearing gravels are dug out of the bank, coconut shells being used for scoops, and are then gathered in wooden pans; the gravel is poured slowly over the washing stone, the material mixing with the stream of water. Gold is then picked from the sandstone and put in quills. The amount of gravel that can be handled by this method is naturally very small. As the water-level in the gravels is usually high, the natives rarely get near bed-rock. All the gold particles appear to be rough, and flour gold is not usually found; the largest nugget observed in the district weighed 107 grammes, and quite a number weighing 10 grammes and more were panned in 1936. The rivers reported to have produced the most are the Sue river, the south Laclo, and the Cler.

The presence of oil in Timor was known long ago, by the oil and gas seepages occurring along the south coast area; natives used to collect this seepage oil by primitive means and use it as a means of illumination.

The two oil districts of Portuguese Timor are the south coast area, and the Manatuto area, the former comprising in the eastern section of the southern coast the portions of Sao Domingos and Lautem Circumscriçoes lying within the coastal strip. The Manatuto area includes the portion of the Circumscrição de Manatuto drained by the Sumasse river, the eastern tributaries of Laleia river and the Sahem river in the south. The outstanding topographical feature of the south coast area is the large limestone masses near Builo, attaining 3500 to 4000 feet and culminating at Mount Mata Bia. The dominating rock types are Triassic limestones, sandstone, and shales. The presence of oil is indicated by numerous oil and gas seepages in Aliambata, Iriamo, Suete and Suai districts.

The Manatuto area belongs topographically to the central divide area described previously. From the point of view of geological history, the entire area was submerged in the lower Permian, vulcanism following the process. A period of emergence followed, from upper Jurrassic till upper Cretaceous, preceding another period of submergence. The rock species encountered belong to the already mentioned igneous and sedimentary varieties. The most interesting part of the Manatuto area seems to be the Cribas district, its structure being favourable as a reservoir for petroleum products.

The oil encountered varies from a thick tarry material to a light green, kerosene-like oil; seepage gases are of hydrocarbonic origin. The study of the oil possibilities of Portuguese Timor has proved their commercial value, and justified further drilling.

The exploration of Portuguese Timor with a view to the future mineral and agricultural development of the colony, commenced in April 1936, and

was completed in June 1937. It soon became apparent that the existing maps were of no use, and that a new map of the entire area would have to be made. Using Dutch Marine Charts as a nucleus, a map was compiled with the aid of Brunton compasses and aneroid barometers, showing the details of topography, location of trails, *postos*, and other features, both natural and cultural. In areas of special economic interest surveys were made with either transit, or plane-table and stadia. The accompanying sketch-map is based upon this map, published by the Asia Investment Company.

At the same time, a geological map was constructed showing roughly the relationships between the various formations encountered. It must be borne in mind that the available time was limited to eighteen months, travel conditions were extremely poor, the topography rough, and the geological conditions very complicated. The legend used in the geological map and the symbols and colours correspond in general with those used in the Geological Map of Dutch Timor, published in 1925 in 'Het Jaarboek van het Mijnwezen in Nederlandsh-Indië.'

Seven field parties did the exploration work throughout the colony, and camps were built in districts of special interest. A full report of the exploration, with detailed maps and photographic documents has now been printed.

TWO ANCIENT IRRIGATION CANALS IN NORTHERN 'IRAQ

M. G. IONIDES

THIS note describes the surmised development and functions of two ancient irrigation canals in the neighbourhood of Kirkuk, from information collected in the course of the design of a new canal in that region. These canals lie in an area called the Hawija, about 60 kilometres to the west of Kirkuk in the angle between the Little Zab and the Tigris. Descending the Zab, the Abbassi is the first of the canals to leave the river, while the Fil takes off about 14 kilometres lower down. Both canals, after a short stretch more or less parallel to the river, curve inland, and finally join a storm-water drainage channel, the Wadi Zaghaitun, which higher upstream is called the Wadi Naft and has its source in the oilfield west of Kirkuk. The area between these canals and the Little Zab must have been under irrigation in former days; now, except for a fringe of cultivation along the river banks, a semi-nomadic population alone can subsist. A traveller passing down the old canals will see at intervals the remains of branch distributing channels which flowed off to water the slopes down to the river; but he will soon realize that this local irrigation was not the chief aim of the canals, for they show no diminution in size as is customary in irrigation canals, but are as large at their tails, where they join the Wadi Zaghaitun, as at their heads.

The Tigris and two of its tributaries, the 'Adhaim and the Diyala, break through a line of hills, the Jabal Hamrin, which run north-west from the foothills of the Zagros mountains near Qizil Ribat. Where the 'Adhaim passes through these hills there are the remains of an old masonry barrage, the Bund-i-'Adhaim, which spanned the river and enabled canals to draw water from above it to irrigate the plain lying to the south-west of the hills. By a similar arrangement the waters of the Diyala are now, and have been for centuries, diverted at the exit of that river from the same range of hills. Now the basin of the 'Adhaim at the present time enjoys only a very meagre supply of water from springs in summer, and this is all led off into small canals for irrigation long before it can reach the Bund-i-'Adhaim. Even if the rainfall were greater then than now, the canals which the Bund-i-'Adhaim fed, no doubt used principally for the cultivation of extensive winter crops and therefore of considerable capacity, could easily absorb much more water in the summer than was available from the 'Adhaim basin alone. To augment the supply therefore water was diverted from the Little Zab by means of the Abbassi and the Fil canals, into the Bund-i-'Adhaim canal system, 120 kilometres from the point where it left the Zab.

The growth of this system was no doubt gradual and came about by a natural development of the Abbassi, the older of the two canals, which was probably first dug for the purposes of local irrigation only. The tail of this canal as originally dug must have reached almost to the Wadi Zaghaitun. When the demands of the Bund-i-'Adhaim system grew, the first step was to enlarge the Abbassi and to re-align and deepen its tail reaches to join the wadi. Beyond kilometre 32·5 the canal originally took a winding course round the contours

to maintain its elevation and command; now a new straight channel was cut through lower ground which served to distribute over a good length of canal the substantially increased fall in levels from the canal to the wadi, and to cause the canal to scour out its bed higher up.

The old Abbassi canal, thus converted, was no doubt still too small to satisfy the growing demand; the Hafr el Fil, "The Elephantine Cut," was therefore excavated. From the Abbassi canal there was an unnecessarily great fall into the Wadi Zaghaitun, and the new Fil canal could therefore be taken

from the river much farther downstream. The width of its bed was about 23 or 25 metres at its head and tail, and in a steeper section in the middle of its course, about 15 metres. The depth to which it was excavated averaged about 7 or 8 metres; its length was 45 kilometres from its mouth to its confluence with the Wadi Zaghaitun, and the total quantity of excavation was some 20 million cubic metres. This great feeder-canal was boldly aligned in a series of straight reaches following the major contours of the ground, and, to retain its general course with a minimum of bends, was passed without scruple through exceedingly heavy cuts. Near the tail it is estimated that the

original bed of the canal was some 23 metres below ground-level, though by a diversion of the line this could not only have been much reduced but the length of the canal would thereby have been shortened. It is probably no exaggeration to say that of the total of 20 million cubic metres of earthwork between a quarter and a third served no other purpose than to satisfy the aesthetic sense of the engineers who planned the canal. The cross-section of the canal is as remarkable as its alignment, for throughout its length a berm of some 15 to 20 metres was left between the edge of the cut and the inner toe of the spoil-banks, plainly to be seen to-day after centuries of weathering. This excellent disposal of the banks, with a berm held sacred when the canal was cleared of silt, raises interesting speculations. No one who has seen the old canals of the Mesopotamian plain can fail to be impressed by the great heaps of silt, piled up from successive clearances, which encumber their banks. Unless the work of clearance is closely controlled, the silt is placed on the very edge of the canal and the banks thus formed grow in height and steepness year by year till finally the canal has to be abandoned. No sign of such decay is to be seen in the Fil Canal. When the administration under which it was constructed and used collapsed, such a canal would be too great for the comparatively small local interests to maintain, and so it has probably lain untouched and unused since that day. The Fil canal probably diverted the whole of the supply of the Zab during the months August to October; for this purpose an annual temporary weir built in the river bed would suffice. Until replaced in recent years by a permanent structure, a weir of this type supplied the Diyala canals already referred to.

Both the Abbassi and the Fil contain some interesting engineering works. The head of the Abbassi is situated where a stratum of sandstone outcrops, and this was cut through so as to leave a spur of the rock in the angle between the canal and the river, thus providing the best possible protection against erosion. Near Km. 2 and Km. 4 substantial drainage channels cross the line of the canal, and spillways built of great sandstone blocks were provided, of which the remains can still be seen. The head of the Fil canal is also well placed, at a point where a bank of hard conglomerate juts out into the river. This was cut through to give the necessary waterway, and circular-nosed piers were built up on each side to form the mouth of the canal. About 6 kilometres from the head of the Fil canal there are the remains of a bridge of which one arch, built of brick in lime mortar, still stands.

I have not sufficient archaeological knowledge to attempt to fix dates for these two ancient canals. In the Administration Report of the Irrigation Department of 'Iraq for 1921–1922 however are some notes on the Bund-i-'Adhaim in which it is stated that that system probably fell into disuse about eight or nine hundred years ago. Some graves and articles found during the excavation of the new canal near Tel Mahuz, which lies to the river side of the Abbassi 7 kilometres from its head, were assigned, after examination by the 'Iraq Department of Antiquities, to Parthian times, 200 B.C. to A.D. 200. Islamic coins were also found during excavation of the canal in the same neighbourhood.

Levels have been taken along both canals. The data give present bed-levels and bank-crest levels, and values estimated for original ground-levels, bed-

levels, bed width, and water slope. All levels are referred to the Great Trigonometrical Survey Datum (G.T.S. Datum), mean sea-level at Fao in the Persian Gulf. In 1936 an inspection pit was sunk in connection with the new canal, and the original bed-level of the Abbassi canal about 200 metres from the river could plainly be seen at a level of 203·4 (G.T.S. Datum), taken from a bench-mark on the river bank just upstream of the head whose value is 199·59. Ten metres of silt have choked the canal at this point.

Shortly before the Great War of 1914–18 the Turkish Government began to excavate a canal, starting near the river just downstream of the old Abbassi Canal, which was probably intended as a revival of the ancient system, with a new barrage to replace the Bund-i-'Adhaim. Only about 300 metres of this canal were dug before the work was interrupted by the outbreak of war.

The canal which the Government of 'Iraq is now constructing is for local irrigation only, a revival of the ancient Abbassi canal in its surmised original form, with a capacity sufficient to irrigate an annual area of 25,000 hectares of winter crops. This is probably a rather greater area than was served by the original Abbassi Canal.

As a rule the ancient canals, whose remains cover nearly all the irrigable areas in 'Iraq, are a hindrance to the modern engineer with their towering heaps of silt; but the Abbassi, whose line the new canal follows closely, is a welcome exception. The site chosen for the mouth of the old canal cannot be bettered, and the new headworks will be tied to the sandstone outcrop as cut through and exposed by the old engineers. Between Km. 17 and 22 the line crosses a spur of high land and the old canal, with its present bed-level still well below natural ground-level, provides a convenient pass for the new work. After Km. 22 the bed of the old canal drops off rather rapidly, for as has been explained, the canal was encouraged to scour out its bed when it was converted to its later function of a feeder canal. Higher water-levels are now needed however for local irrigation, and for the next 11 kilometres the old cut can be used without further excavation.

Note: This paper was accompanied by tables giving the estimated average discharges of the Little Zab and the Fil canal in its prime, and the levels of the old Abbassi and Fil canals, with estimated original levels and slopes. They have been deposited in the Library for reference.

INTERNATIONAL GEOGRAPHICAL CONGRESS, AMSTERDAM, 1938

A GENERAL ASSEMBLY of the International Geographical Union met in Amsterdam in July at the invitation of the Royal Netherlands government, and, concurrently, under the auspices of the Union, an International Geographical Congress was held from July 18 to 28. Sir Charles Close, President of the Union, presided over both the Assembly and the Congress. Before dealing with the work of the latter, it will be convenient to deal briefly with the two meetings of the Union. The first, on the morning of July 18, opened with a report by the Secretary-General, Professor de Martonne, on the finances of the Union and the work of the various Commissions since the Warsaw Congress. A small commission was then appointed to report to the next meeting upon the financial position. The British National Committee had proposed to submit a resolution that the papers read at the Congress should be printed and circulated in conveniently sized volumes: the Organizing Committee however had already accepted this suggestion, so that the resolution was not brought forward. The Committee had also adopted the unusual but very satisfactory plan of printing all the communications and the reports on the various questions before the opening of the Congress, and no fewer than eleven volumes, with a total of more than three thousand pages, had been issued to members. The President proposed the election of Professor de Martonne as president for the ensuing period: there being no other proposal, Professor de Martonne was unanimously elected. In his place as Secretary-General of the Union Professor P. L. Michotte, of Louvain, was elected, with Mlle. M. A. L. Lefèvre as assistant.

The second meeting was held on the morning of July 28. A number of resolutions submitted by the sections were adopted, and some changes in the scope and composition of the Commissions were effected. These remain six in number. The Commission on types of rural habitation, which dates from the Cairo Congress of 1925, becomes the Commission for the study of population, with Professor H. J. Fleure as president. In the Commission on pliocene and pleistocene terraces, Professor H. Baulig was appointed president in succession to Professor Douglas Johnson: no appointment of secretary was made, the Bureau remaining at Oxford under the direction of Dr. K. S. Sandford. The Commission for the publication of ancient maps was reconstituted with a much enlarged membership, under the presidency of Mr. W. A. Engelbrecht, in place of Professor R. Almagià. No change was made in the three remaining Commissions, on climatic variations, air phototopography, and the cartography of tertiary surfaces of erosion.

It was resolved that the next Congress should be held in four years' time, the decision as to the place of meeting being left to the Executive Committee. A letter from the Belgian delegation was then read, strongly urging the claim of Belgium, though recognizing the practice of the Union not to hold successive Congresses in contiguous countries. The finance commission reported favourably upon the finances of the Union, and it was agreed that the unit of contribution for the ensuing period should be equivalent to the 400 francs French adopted at the meeting of the Union in Warsaw in 1934.

The Congress, under the high patronage of H.M. Queen Wilhelmina, was organized by the Netherlands National Committee for Geography, which had delegated the task to a small committee with Professor J. P. Kleiweg de Zwaan as president, and Mr. E. J. Voûte as secretary. The efficient preparatory work of this committee ensured that the heavy programme was carried through smoothly and without delay. The Congress was well attended, more than twelve hundred members having registered, of whom over a thousand were present. The Bureau of the Congress and most of the sections were comfortably and appropriately housed under one roof in the fine building of the Koloniaal Instituut. The large lecture theatre easily accommodated the general gatherings, and each section was provided with adequate and pleasant quarters. The main hall of the Museum also housed the exhibition of official cartography. A restaurant and cafeteria in the building contributed to the convenience of members. A special word of praise must be given to the reception bureau, where under the direction of Mlle. A. C. Schippers a number of young ladies were always ready to assist and to advise. Among the literature presented to members was the current number of the *Tijdschrift* of the Royal Netherlands Geographical Society, devoted entirely to essays in French upon the physical and human geography of the Netherlands. This general account was supplemented in detail by the comprehensive handbooks to the longer excursions, also given to each member. Though the Congress did not open officially until July 18, many members had arrived on the two previous days, and the National Committee gave a reception on the evening of the seventeenth. The opening session took place on the afternoon of July 18, when, in the great hall of the Concertgebouw, in the presence of Rear-Admiral Jhr. G. L. Schorer, representing H.M. Queen Wilhelmina, Sir Charles Close delivered his presidential address. This was followed by a speech of welcome from the Minister for Public Instruction, H.E. Prof. Dr. J. R. Slotemaker de Bruïne, and shorter speeches from the chiefs of several delegations.

The general daily programme of the Congress comprised a lecture at 9 a.m. on some aspect of the physical and human geography of Holland or the Dutch East Indies, meetings of the ten sections or subsections from 9.45 a.m. to 12.45 p.m., excursions or visits to institutions in the afternoon, and lectures or social gatherings in the evening. The papers to be read in the sections had been printed in separate volumes and circulated to those interested some time before the opening of the Congress. A number of questions had been proposed for the consideration of each section, and in the main the papers and discussions were confined to these subjects. The papers submitted on each question had been summarized by *rapporteurs:* their reports, printed in one volume, were also circulated beforehand, and served as a guide to the activities of the whole Congress. Members had ample opportunity therefore of ascertaining the scope of the various discussions, and of arranging to attend, as far as possible, those which interested them. These reports were not read at the sections, nor was it intended that the papers should be read in detail. Theoretically, in order to give time for adequate discussion each speaker was allowed ten minutes in which to summarize his contribution. This procedure was not always strictly adhered to, much depending upon the presidents of the sections, but there is no doubt that on the whole discussion, which should be the aim of such meet-

ings, was considerably encouraged by this procedure. The task of obtaining and publishing this quantity of material must have entailed much heavy work for the Secretariat, and the Organizing Committee is to be congratulated on the results of its labours.

British geographers took part in the work of all the sections, the official cartographical institutions being especially well represented in Section I (Cartography) and Section IIb (Oceanography). In other sections however representation was not so complete; members did not know until their arrival in Amsterdam which of their colleagues would be present, and several who had contributed papers did not attend. Questions treated in the section on colonial geography, for example, would have benefited by contributions from some of our geographically-minded colonial administrators. During the Congress a meeting was arranged on the initiative of the Society's delegates to bring British members together; but in preparing for a future Congress the National Committee for Geography might consider calling a representative meeting of British geographers in London before the opening of the Congress, so that British representation in all sections might be adequately planned and coordinated.

Two evening lectures, both in English, were delivered: by Mr. W. A. Engelbrecht on the influence of Dutch cartography on that of other countries, and by Professor Kenneth Mason on the exploration of the Karakoram, and the difficulties of its nomenclature.

Two exhibitions were arranged in connection with the Congress: an international exhibition of official cartography in the hall of the Koloniaal Museum, and an exhibition of Dutch historical cartography in the Scheepvaart Museum. The exhibition of official cartography was first held at Warsaw on the initiative of Professor Romer. This year the work of thirteen countries was represented, and the sheets of the 1/Million Map were also displayed. The exhibits, varying considerably in size and character, were divided into three sections: systematic cartography, retrospective display, and characteristic types. The several Dutch cartographical institutes showed a comprehensive series of maps, largely designed to illustrate the application of photogrammetry. Interesting maps of the Dutch East Indies were included, and France and Italy also exhibited maps of their colonial possessions. British geographers will have seen with justifiable pride the fine series of Ordnance Survey maps, but will have regretted that no maps of the British Dominions or Colonies were shown. Some of the special maps, particularly those drawn by automatic plotting machines, were of great beauty and scientific value.

The historical collection at the Scheepvaart Museum was devoted mainly to the works—atlases, globes, and maps—of the great Dutch cartographers of the sixteenth and seventeenth centuries, drawn from Dutch collections and supplemented with reproductions of those in other countries. The collection of Dutch "rutters" and sea atlases was particularly comprehensive, and the whole formed notable testimony to the share of Holland in cartographical progress.

The Netherlands Government gave a reception in the picture galleries of the Rijksmuseum, at which H.E. the Minister of Public Instruction received the guests, who had the opportunity of examining the treasures of the Dutch school in most pleasant conditions; and the City of Amsterdam entertained the heads

of the official delegations at a banquet. Excursions during the Congress enabled members to see something of the canals and docks of Amsterdam, North Holland, and the reclamation work on the Ijssel Meer (formerly the Zuider Zee). For the various sections there were also visits to institutions of special interest to them, and for the ladies the Comité de Dames, under the presidency of Madame Kleiweg de Zwaan, had arranged a daily programme of very varied interest.

The sentiments of every one who attended the Congress were most adequately and eloquently expressed by Professor Em. de Martonne at the closing session on July 28. Thanks to detailed and thoughtful organization in advance, the determination of the hosts to augment in every possible way the interest and pleasure of the visit, and the many attractions of the City of Amsterdam, the Congress of 1938 was an outstanding success, and worthy to serve as a model for future meetings. Some account of the work of the sections and of the more extended excursions will be given in an early number of the *Journal*.

NORTH AFRICA

AFRIQUE SEPTENTRIONALE ET OCCIDENTALE. By AUGUSTIN BERNARD. Généralités—Afrique du Nord. (Géographie Universelle. Edited by P. VIDAL DE LA BLACHE and L. GALLOIS. Tome XI. Première partie.) *Paris: Armand Colin*, 1937. 11½×8 *inches; 284 pages; illustrations and maps. 100 fr.*

THIS is an important book for a number of reasons. The author, Mons. Augustin Bernard, Professor of the Geography and Colonization of North Africa at the Sorbonne, has devoted most of his scientific and literary activity to the understanding and portraying of North Africa, has lived in and travelled widely in North Africa, and has acted for many years as a clearing-house for North African literature of geographical import. This is the first time since Morocco has been opened to general scientific observation that the geography of north-west Africa has been treated as a whole; therefore the book contains a number of entirely new maps, and much new literary matter relevant to north-West Africa, which have only recently been made possible, and which are here presented for the first time. Further, as North Africa is looming ever larger on the Mediterranean political horizon, a reliable work on the geography of the area, written with scientific detachment and balanced judgment born of long study, is particularly valuable at the present time.

The Introduction is a summary statement of general information on the continent of Africa as a whole, in which the parts on colonization, the sharing out of Africa, and Africa in world economy, will be read with greatest interest. The remainder of the book is concerned with north-west Africa (Morocco, Algeria, Tunisia) as far south as the Saharan fringe, for which, after discussing the suitability or otherwise of the various names which have been used (Maghreb, Barbary States, etc.), none of which have had general acceptance, the author suggests the term Berberia (*Berbérie*) as probably the most satisfactory, and proceeds to use this throughout the book. Certainly some such name is desirable to indicate succinctly, and without misunderstanding, this generally recognized physical unit which, ending where the Saharan platform begins, includes less territory than the modern political boundaries of the Barbary States (Morocco, Algeria, Tunisia) which extend far into the Sahara proper; but, in English, probably Barbary would be accepted more readily. Chapter I purports to be concerned with structure, but deals also with relief, summarizing our knowledge of structural and tectonic influences on the development of the latter. Relief as such however is only perfunctorily discussed, and although this may be justifiable in that detailed accounts of the relief are given in the regional studies of each of the three included countries which come later in the book, omission of a map to show the relief of the area as a whole hardly seems justifiable, particularly as, even in the later chapters which deal with the countries regionally, there are no general relief maps to accompany the geological maps given. Climate is discussed at greater length, and for this reason and on account of the great variability of the climatic phenomena, it is regrettable that no temperature graphs are included, and that the mean monthly precipitation graphs given are not dispersion diagrams. The new mean annual precipitation map given for the whole of Berberia is however a useful feature.

A summary of pre-historic climate change and a discussion of the amount of increase of aridity within historic times form a useful background for the discussion of the vegetation and of human distributions from pre-historic times, which comes later in the work. The geographical account of the vegetation is

substantiated by considerable botanical detail, and along with the new vegetation map for the whole of north-west Africa which accompanies it, this section forms an interesting feature. An important chapter on the native population follows. According to the author it is finally acknowledged that there are now no Arabs in north-west Africa; there are only Berbers, most of whom are Arabized linguistically and culturally, to varying degrees in different parts. He believes that, physically, the present inhabitants scarcely differ from those who inhabited the region as far back as 3000 years ago at least, and that the Arab invasions within historic times (eleventh century A.D. mainly), bringing in some 200,000 families according to some estimates, have scarcely modified the physical type of the original inhabitants. Linguistically and culturally however the Arab and later invasions have been of paramount importance in that now Berber dialects are spoken by only 40 per cent. of the native population even in Morocco (which is the least Arabized of the three main parts of Berberia), by only 30 per cent. in Algeria, and by only 20 per cent. in Tunisia, and many of these, even, are bilingual. Colonial population is given a measure of attention and the author rightly stresses the difficulties of implanting a numerous immigrant European population in the midst of a still more numerous native population which is increasing rapidly everywhere, particularly in Algeria, where, since 1856, the native population has considerably more than doubled. In this section one regrets the absence of a general map of Berberia showing distribution and density of European population, with perhaps some indication of nationality distribution, though these are discussed quite fully in the text.

The next part of the book, about one-half of the whole, describes regionally the three political entities included. The regional subdivision of Morocco is largely that first used by Hardy and Celérier in 1922 which has been generally accepted, but Algeria, which apart from the attempt by Augustin Bernard and Ficheur in 1902 has not previously been described regionally in any adequate sense, is treated in a new way. It is divided into two principal parts, *i.e.* western and eastern Algeria, the line of division being through the town of Algiers, and within each of these major divisions there is subdivision in both west–east and north–south directions. These regions may not meet with final approval, but they give a much better regional conception of Algeria than it has been possible to get hitherto. Tunisia is divided primarily into a northern part and a central and southern part, taking the Medjerda valley as demarcation, and one is not convinced that this is preferable to taking the prominent relief feature to the south of the Medjerda valley, known as the Tunisian dorsal, as demarcation between south and north. But, in a regional sense, North Africa is still very little known, as there are very few regional monographs on the different parts of this area, and even if the subdivisions used by the author in the present work are not finally adopted, one must be grateful for these first attempts at a regional description by one who is so well qualified to undertake it.

The final chapter is devoted to a summary consideration of the modern economic geography of the whole area and includes useful new maps to show agriculture, mines, and communications.

Not the least valuable part, as in the case of the other volumes of this series, is the well-sifted bibliography which accompanies each chapter. Mons. Augustin Bernard is to be warmly congratulated on the timely production of a well-balanced and scholarly addition to the geographical literature on North Africa. W. F.

REVIEWS

EUROPE

THE LAND OF BRITAIN: the report of the Land Utilisation Survey of Britain. Edited by L. DUDLEY STAMP. Part 69. Lincolnshire (Parts of Holland). Pp. 83. By GEORGE I. SMITH. Part 79. Middlesex and the London Region. Pp. 117–304. By E. C. WILLATTS. Part 86. Somerset. Pp. 141. By T. STUART-MENTEATH . . . with an historical chapter by S. C. MORLAND. *London: Published for the Survey by "Geographical Publications,"* 1937 (Nos. 69 and 79) and 1938 (No. 86). 11 × 8½ inches. *2s 6d; 4s; 4s*

Mr. T. Stuart-Menteath in his report has examined the present land-use of Somerset in great detail. This account makes very full use of published material and is justifiably biassed in favour of the particular conditions which prevail in the county. A full analysis is made of the areas liable to flooding and demonstration is made of the improvement of hill drainage speeding up the rate of flood flow and thereby the additional burden thrown on the riparian owners of the lower courses. The accounts of the withy beds and orchards form particularly interesting sub-sections, with details of tree varieties grown and the technique of management. In section iv the author has collected a valuable set of information from specimen farms under such headings as area, tenure, soils, growing seasons, working capital, labour, crops, preparation of the ground, manuring, yield, grassland and livestock. This is a comprehensive statement of farms each of which illustrates conditions prevailing in the various physical regions established by the author. One wonders how far the farms could be regarded as typical specimens; the answer can only be given after extensive team inquiry as practised by the United States agricultural research stations. This report concludes with a section on "The making of the field pattern of Somerset," by S. C. Morland, which provides a clear account of the earlier agricultural conditions based on both maps and taxation records.

Mr. G. I. Smith in his report on Lincolnshire (Parts of Holland) has given a clear account of one of the most intensively arable areas of Britain: *vide* Fig. 23 in the report. The region being formed of alluvium and boulder clay varieties, the author was forced back on to soil as the basis of his divisions, and thus early came on the difficulty of loose terminology, *e.g.* " silt," used by pedologists, geologists, and farmers for three different materials. A soil survey was made by the author based both on field work and laboratory analysis, and from this Fig. 3 was constructed. Like the Somerset Report considerable attention has been paid to the drainage systems on account of their fundamental importance. Specimen farm lay-outs are given showing the rectangular field pattern and the diversity of farms due to different crops (early potato, bulb and fruit) or different soils (peat or clay).

In the longest report of the series Dr. E. C. Willatts analyses the county of Middlesex and the unwieldy, indefinite London region. The area selected after various considerations is north of the North Downs, approximately from Wrotham to Farnborough, as far as Berkhampstead in the north-west to Chelmsford in the north-east. Eccentrically placed in this rectangle lies the ever-increasing area of London, which is spreading nearly everywhere over the twenty-eight Land-Use Regions of Dr. Willatts, being almost exclusively controlled by transport facilities. It is on account of the varied soil and relief background and the superimposed economic pattern of settlement that so

many regions are required. Each region is described in systematic detail and the author shows a deep knowledge of the farm economy, both as to farming technique and costs. One particularly useful feature of the regional descriptions is the concluding note on changes of land utilization since the tithe maps, *c.* 1840, were made. The changes are illustrated in each case by small analytical maps.

Section v is devoted to the land utilization of the former and larger county of Middlesex, based both on old topographical accounts and on old detailed maps. Various analyses have been made on approximately the same scale of Rocque and Greenwood's Surveys, and by the effective tones used the author has emphasized his conclusions. This report sets a standard which, while possibly beyond the original scope of these monographs, may prove of help to later writers of reports in the series as a model on which to base their studies.

A. C. O.

CZECHOSLOVAKIA: keystone of peace and democracy. By Lieutenant-Commander EDGAR P. YOUNG. *London: Victor Gollancz*, 1938. 9×5½ *inches; 400 pages; maps. 12s 6d*

This is a straightforward account which errs, if at all, in being too factual and in not perhaps allowing sufficiently for the psychological aspects of the problems which Czechoslovakia is facing. The author starts with a brief history of the country, and describes the land, and its people and their political development. Three chapters are then devoted to social organization. The latter part of the book deals with the minorities, whose differing origin is emphasized, and the consequent attitude of Czechoslovakia towards its neighbours. No one needs to forget the reorientation which followed when Prague replaced Vienna and Budapest as capital; nor the country's dependence on the goodwill of its neighbours for the passage of goods for export. It is less often recalled that agriculture and forestry are as important as industry; the small farms maintain a high standard, though grain has been imported for political reasons from Romania and Yugoslavia. The author believes that the minority groups are not economic entities, and that Czechoslovakia could not be reconstituted as "another Switzerland." On the whole his arguments, though marred by occasional perversity, are fair. Further information and statistics are contained in the numerous appendices. A good map of the physical geography of the country is lacking; the word *Sudeten* does not appear on any of the maps provided. J. P. H. M.

ALBANIAN JOURNEY. By BERNARD NEWMAN. (Pitman's Travel Series.) *London: Sir Isaac Pitman & Sons*, [1938]. 7½×5 *inches;* viii+96 *pages; illustrations and route-map. 1s 9d*

On the first page of this book Mr. Newman states that he "had more exciting times in Albania than anywhere else." This is surely a misprint for "any one else," for Mr. Newman saw many marvels not given to others to behold. These included orange trees which bear 10,000 oranges per annum, peasants working in the fields with rifles within easy reach, a slave market for labourers at Korrchë, and girls standing under trees with the amount of their dowry chalked above their heads. Mr. Newman even found marvels in places which, if his earlier book is to be believed, he has never visited. His acquaintance with Albania is in fact so slight that despite their characteristic costumes he has labelled a photograph of mountaineers from the extreme north as "Albanian Tosk family," the Tosks being south Albanians who dress, except occasionally on gala days, as Europeans. M. M. H.

DIE SIEDLUNGEN SÜDALBANIENS. By MARTIN URBAN. (Tübinger geogr. geol. Abh. Reihe II. Heft 4.) *Öhringen: F. Rau*, 1938. 9×6 *inches; 198 pages; illustrations, maps, and plans. M.*4.

This scholarly record is admittedly inspired by the similar work of Baron Nopcska on the settlements of north Albania. Its appearance is timely, for as the author well remarks, Albania is changing with extreme rapidity and its modernization is obliterating much valuable knowledge of past days. Dr. Urban begins by describing the various types of dwelling in his chosen area; these include caves, huts temporary and permanent, single-room houses with appended kitchen, single-storey houses of several rooms, and two-storey houses of several styles. On passing to the building materials he notes the predominance of stone in the construction of both walls and roof, and attributes this to the need for security which existed till our own times. After discussing peasant ownership and landlordism, the two chief agricultural systems, he considers the formation of villages. Some are only agglomerations of huts round a landlord's house, many are unbelievably scattered, and others closely built; he acutely observes that the compactness of the last, Cvijić's "Mediterranean type," may be conditioned by the nature of the water supply. In a brief chapter he points out the importance of the towns as market centres. Next he discusses the infinite variety of the plains, hills, and mountains comprising the landscape, and concludes by analysing the effect of local customs, physical features, and history on the dwellings. He supplements his verbal descriptions with a wealth of illustrations, the majority of the plans and photographs being from his own pen or camera, the maps the best available. Following sound geographical principles, he uses the Albanian form of place-names, even where a conventional, non-Albanian form has taken firm root in the outside world, *e.g.* he uses Vlonë instead of the Italianized Valona.

But he had only a summer's vacation for his field investigations, and the complex Balkans exact years of study for their understanding. The lack of time has prevented him from interpreting as acceptably as he has recorded. Thus stone is probably the commonest building material, not because it is the strongest and safest, but because it is the handiest, a fact he almost discerned when discussing the dwellings on the stoneless, alluvial Myzeqe plain; most Albanians are too poor to pay for transporting or manufacturing other materials. He rightly states that within recent centuries Albanians have ousted Slavs from many villages, but does not consider who lived in these villages before they were seized by the Slavs, notorious newcomers to Europe. He ascribes the compactness of the Greek villages in south Albania to the influence of the Greek priesthood, but fails to explain why the mountain villages of the Vlachs, who enjoyed the same priesthood, are scattered. He attributes the subsistence farming of the peasants to the lack of public security, but omits to reflect on the lack of facilities for export. Above all, he has too lightly believed chauvinistic Albanians who, despising the best in their country, told him that the Turks divided the Albanians into tribes, introduced customary law, imposed landlordism, and destroyed the native pre-Turkish nobility. M. M. H.

ASIA

THE MARIA GONDS OF BASTAR. By W. V. GRIGSON. *London: Oxford University Press*, 1938. 9×5½ *inches;* xxii+350 *pages; illustrations and maps.* 30*s*

In area the little-known State of Bastar is considerably larger than Palestine, with little more than half its population. The bulk of the people are Gonds,

a vague term which includes the two sections of the Marias: the Hill Marias (about 11,500 strong) in the north-west quadrant of the State, and the Bison-horn Marias (156,000) of the more open country to the south-east.

These two groups, undoubtedly of one blood, speak dialects of a Dravidian language, Gondi, which are mutually unintelligible, and they communicate with each other in Halbi, the patois of the old feudal militia of the country, a blend of Marathi and East Hindi so intimate that experts cannot decide under which of those two languages it should be classed. Eastward Halbi merges into Oriya. In the south Telugu influence prevails; the present ruling dynasty of chiefs is a cadet branch of the Kakatiyas of Warangal in the east Deccan, whose empire was crushed by the Delhi Muslims in A.D. 1323. Another Telugu dynasty preceded them, as is testified by numerous Telugu inscriptions, dating from the eleventh century, when Bastar was invaded by the Tamil Cholas.

The effect of these cross-currents from north, south, east and west on the tribal culture of Bastar, the affinities of which are ably summarized by Professor Hutton in his Introduction, is made clear by a map (p. 40), which is a model of what an ethnographic map should be. Patient attention to geographical details has enabled Mr. Grigson, who was Administrator of Bastar, 1927–31, to straighten out the terminological confusion of previous writers, to elucidate the relations between the Marias and their neighbours, and to unravel the intricacies of their clan-system.

As elsewhere in India, the basic factor of Maria society is the clan, the "exogamous sept" as it used to be called. The clans of the Hill Marias are "practically political units," each with its own clan-area, clan-council, and clan-cult. The clans of the Bison-horn Marias are scattered; there is no compact clan-area; each clan has villages that are far apart and each village contains several intermarrying clans; distance weakens the ties of the clan-cult and clan-council and strengthens those of the village.

From these simple facts springs everything that matters in the social, economic, and religious life of the Marias. The system is elastic and ill-suited to the fixed ideas of orthodox administration. Official ignorance, and the oppression which, even with the best intentions, it engenders, played havoc with these attractive and peace-loving people, untainted by head-hunting, human sacrifice, or tribal war. Mr. Grigson has produced a book of outstanding merit, and his labour has not been in vain. Realizing the misfit of alien institutions, his successor framed a State Order which deprived the civil and criminal courts of jurisdiction over the domestic concerns of the Marias, and restored to their tribal councils the privilege they have enjoyed from time immemorial of settling their own affairs.

F. J. R.

THE SOILS OF PALESTINE: studies in soil formation and land utilization in the Mediterranean. By A. REIFENBERG. Translated by C. L. WHITTLES. *London: Thomas Murby & Co.*, 1938. $8\frac{1}{2} \times 5\frac{1}{2}$ *inches;* viii+132 *pages; illustrations and maps.* 14*s*

This slim, concise volume is a welcome contribution to our knowledge of soils, the basic importance of which, alike to academic geography and to land utilization, has long been recognized. It is valuable not only for its explanation of the types and distribution of soils in Palestine itself, but also for its discussion of the processes of weathering and of soil formation generally within the Mediterranean region. The steady deterioration of the land through soil erosion during the last 1500 years, and the rapid agricultural development now in progress in Palestine, indicate how important it is accurately to ascertain the intrinsic properties and potentialities of its varied soils.

The author rightly emphasizes the part played by climate in the formation and differentiation of the soils of Palestine, and finds in the conditions of rainfall the criterion for classifying and mapping them (see Figs. 1 and 2, pp. 10 and 11). Thus he distinguishes four regional divisions of soils: the arid, semi-arid, humid, and semi-humid regions. The soil types of each region are separately examined and their distribution and utility indicated. Generally, the author has much to say on the origin of soils and the problems therein involved, and analyses of samples are generously given. Some knowledge of chemistry as applied to soil science is called for, if the reader wishes to follow the discussion closely, but even those who must abandon the trail at times, owing to these technicalities, can appreciate the conclusions reached and their bearing on geographical problems.

The red sandy variety of soils have a particular interest. They are derived from the weathering of calcareous sandstone and cover the maritime plain, eastwards of the belt of sand dunes, between Haifa in the north and Jaffa and Lydda in the south. They are the most suited, and are now adapted, to citrus plantations, although liming and fertilizing, as well as careful irrigation, are necessary. It is however necessary to avoid the Nazzas soils, "a compact, impermeable pan-layer, concretionary in character" which is sometimes found at slight depths.

There are discussions, too, in this book of the relation of soils to agriculture, intensive and extensive, of the problems of irrigation, notably the effects of different kinds of water on different soils and on different crops, and of the need for deep manuring, since the movement of water in the soil is normally from below upwards. The last chapter, entitled "The Zionist colonization," summarizes recent trends in farming and suggests future possibilities. Mr. Reifenberg states that 36 per cent. of Palestine is cultivable, and 15 per cent. of this area is still uncultivated. He ends his book boldly by estimating on the basis of the quality of the soil and the size of family holdings that there is still room for 78,000 families. We may wonder what value should be attached to an estimate of this kind, but we can only welcome the scientific data which this book contributes to problems of immediate importance. W. G. E.

NORTHERN NAJD: a journey from Jerusalem to Anaiza in Qasim. By CARLO GUARMANI. Translated from the Italian by LADY CAPEL-CURE. Edited by DOUGLAS CARRUTHERS. *London: The Argonaut Press*, 1938. (Sixteenth publication. General Editor: N. M. PENZER.) $10\frac{1}{2} \times 7\frac{1}{2}$ *inches;* xliv+134 *pages; illustrations and maps.* £2 2*s*

Every lover of Arabian travels must be delighted to see Carlo Guarmani come at last into his own. His journey was accomplished in 1864, in districts of northern Arabia where Wallin and Palgrave alone had preceded him, and that over only a portion of his way. He was the first to visit Khaibar, and still remains our only witness for the route from Taima thither. From Khaibar he travelled to Anaiza, Boraida, and Hail, and spent a month among the Shammar of the Jabal, wandering at will and in safety under the strong rule of Talal ibn Rashid, and acquiring perhaps his most important geographical knowledge of a region which Wallin and Palgrave had only partially visited. He returned to Teima, with a detour to Qasr Haiyaniya and Jubba on which doubt has been thrown, but which Mr. Carruthers on the whole vindicates. From Jubba, he crossed the Nafud by the track of his predecessors, and thence returned into Syria by the Wadi Sirhan.

From the geographical point of view alone his journey had an importance which has not yet been superseded. For that part of it on which doubts had

been expressed by no less an authority than Doughty, namely, the visit to Khaibar and Anaiza, Carlo Guarmani is upheld and conclusively vindicated by Mr. Carruthers, himself one of the small and illustrious band who know the north-western sands. No one else could have added so much of interest to a book already interesting on its own account. The introduction is excellent, and the notes could only have been written by one who is both a traveller and a student. The maps, the choice of illustrations, and the whole appearance of the book are beyond praise, and the author has also been singularly lucky in his translator. His posthumous fate has been rare and fortunate, but it is well deserved, for apart from all else his writing has a vivid freshness about it. He has a quick eye for detail, and few travellers have known the Badawin more intimately, or in a more friendly way. F. S.

AFRICA

A HISTORY OF UGANDA LAND AND SURVEYS AND OF THE Uganda Land and Survey Department. By H. B. THOMAS and A. E. SPENCER. *Entebbe: Government Press, Uganda [London: Crown Agents]*, 1938. 10×6 *inches; 206 pages; maps. 7s 6d*

The authors have produced an interesting little volume which not only gives an account of all the survey and land activities since Speke's journey of 1862, but which makes a very readable history of the development of the country. As is usual in newly opened territories, Uganda was once threatened with fantastic schemes for making vast profits from its natural resources, schemes which, happily, were shelved, because the government was more than usually dilatory on account of shortage of staff.

We are given the story of the early boundary commissions, of much rapid triangulation and topography, of endless arguments on land policy resulting in many changes in the laws, and of the 1/10,000 "Mailo" cadastral survey of the allotments derived from the Uganda Agreement. The "Mailo" survey occupied the Department for over thirty years and was completed in 1936. The methods used were obviously designed by people who had that sense of proportion which puts accuracy in its proper relation to the value of the land and to the funds and time available. Thirty years seems a long time, but great difficulties were encountered; and if the more usual cadastral survey methods had been employed instead of plane-tabling, conditions would have so changed before the work could have been finished as to have made the plans of little value. Parts of the book are for local consumption and many readers will find too much about such matters as buildings and extension of offices, while most of the eighty-six pages of appendices might have been left in the Departmental files, where those who really need detailed information could look it up.

Attention is drawn to the gradual change in the mode of travel from safari to the motor car. Though the modern official will see far more of the country, he will never get to know it as did his predecessor of safari days. F. J. S.

DESCRIPTION DE LA CÔTE D'AFRIQUE DE CEUTA AU SÉNÉGAL. By VALENTIM FERNANDES (1506–1507). Edited by P. DE CENIVAL et TH. MONOD. (Publns. Com. Études Hist. et Scient. Afrique Occidentale Française. Sér. A. No. 6.) *Paris: Larose*, 1938. 10×6½ *inches; 214 pages; illustration and sketch-map*

The most important source for the history of Western Africa in the late fifteenth century which remains to be adequately edited is the manuscript collection formed, and in part compiled, by Valentim Fernandes. The present monograph

deals with part of the *Descripçam* of the African coast from Ceuta to the Isles de Los; the portion here printed extends to the Senegal river, and includes the valuable account of Western Mauritania by João Rodrigues. The editing of this section has been carried out by M. Monod, who possesses extensive personal knowledge of the country.

As an agent at the Portuguese trading post of Arguim, Rodrigues was well placed to study the tribes of the littoral, and the commercial relations with the interior. His interests also extended to many branches of natural history. His description of the debased tribes of Azenegues, or Sanhaja, who eked out a miserable existence by fishing, is applicable with little alteration to the inhabitants of this region to-day. It is strange that no mention is made of the *litham* or veil worn by their nomad relations of the interior. With regard to the trade with Timbuktu and Melli, particularly in gold, this account follows, and to some extent amplifies, that given by the Venetian Cadamosto. It is clearly stated that the gold reached Timbuktu on canoes down the Niger, and, though the "silent trade" is described, it is said that the intermediaries merely professed ignorance of the people who produced the gold in order to keep the traffic in their own hands. It is apparent that a good deal of Cadamosto's narrative, with which Fernandes was acquainted, was incorporated in this text. On one point upon which additional information might have been expected, that is, the Portuguese factory at Wadan, the text is silent, though Wadan and the surrounding region are described.

This book contains a transcription of the original Portuguese and a literal French translation, many illuminating notes, and a useful bibliography. In discussing contemporary accounts, mention might have been made of Antonio Malfante's, although it can scarcely have been known to Fernandes. G. R. C.

L'AFRIQUE AU XVI^e^ SIÈCLE ET LE COMMERCE ANVERSOIS. By J. Denucé. (Collection de documents pour l'histoire du commerce. II.) *Anvers: De Sikkel*, 1937. 13 × 10 *inches; 120 pages; illustrations and facsimile map in 9 sheets ("reproduction de la carte murale de Blaeu-Verbist de* 1644.") *Fr.* 200 (*in cloth fr.* 230)

Dr. Denucé has been known for many years for his substantial studies of early voyages and cartography, and other cognate subjects; he is not content to rest on his laurels, but is continuing his work in this field. He has lately been studying some previously neglected documents in the Antwerp archives which illustrate the prominent part played by that city in early days in furthering European enterprise in the newly opened parts of Africa, and he sketches the results in the well-produced work under review. Antwerp was the centre on which the adventurers of Spain and Portugal largely depended for financial support and a market for Eastern commodities, and the new material brings this well-known fact into strong relief, an interesting side-light being afforded, for example, by the records of assurances of ships effected with Antwerp financiers. In a series of chapters Dr. Denucé takes us through successive sections of the African coasts and islands, noting the enterprises carried on in each by the merchant princes: Hooftman especially in the north, Groenenborch and Van Dale in the Canaries, and Schetz, Haro, De Moucheron and others in Guinea, Angola, and beyond; the general part played by Antwerp being summarized in a separate chapter.

While the history of commerce is no doubt a concern of the geographer, it is the side of the study relating to the mapping of Africa in those times that will arouse his more immediate interest; and here we confess to some disappointment: its treatment by Dr. Denucé is hardly what we should have expected

from a writer of his previous reputation. The central theme is here Blaeu's wall-map of Africa, of which a full-size facsimile is given from the well-preserved example of 1644 bearing the imprint of Verbist of Antwerp. Strangely enough the map is considered throughout as a product of that date. While criticizing Dr. Wieder for omitting to mention this issue in his elaborate study of Blaeu's work given in his 'Monumenta Cartographica,' Dr. Denucé entirely ignores the various issues, beginning quite early in the century, which are fully dealt with in that work, the series starting from the first publication of the same map, by the same engraver Vanden Ende, in 1608, and continuing in one form or another down to the Bologna edition of 1673 of which a sadly mutilated copy is in the Society's map-room. Even the 1608 issue is not the earliest appearance of the picture offered, for it is virtually the same, though somewhat more elaborated, as that found in Blaeu's big world-map of 1605, repeated too in the Hondius world maps of 1608 and 1611–18. And the lost large maps of the continents by Jodocus Hondius may quite possibly have been the earliest of the series. (It is noteworthy that the re-issue in 1624 of Blaeu's four big maps of the Continents was by Henry Hondius, which seems to bear out Dr. Wieder's suggestion that there was some collaboration between the firms of Hondius and Blaeu.) The vogue of the Africa in the early decades of the century is shown incidentally by its use as a model for Speed's Atlas-map of 1626, even to the marginal pictures of towns and of native types. Therefore it is quite misleading to treat the 1644 issue as representing the geographical knowledge of its date.[1]

It is surprising, again, that one with Dr. Denucé's experience of early cartography should subscribe to the facile but ill-founded idea that the maps of the sixteenth and seventeenth centuries prove a knowledge at the time of the whole interior system of lakes and rivers. The exaggerations of their makers were pointed out in the seventeenth century by the learned historian Ludolf, while D'Anville in the eighteenth had the acumen to perceive that the long-current picture of the interior was merely the result of an undue extension towards the centre of the known coastal regions. One had hoped that the fallacy had received its quietus through the work of so competent an authority as the late Dr. Ravenstein (among others) whose considered verdict was that "Pigafetta's fantastic map . . . merely proves the incapacity of its author to deal with questions of critical geography." Yet Dr. Denucé regards that map as evidence that the great Central African lakes were well known to the pioneers of that day.

Criticisms might be offered also on various minor points. The map in question is held to inaugurate (in 1644?) Blaeu's great cartographical output, and to be also the first large map of Africa known to us, though an equally large map had been printed by Gastaldi in Venice in 1564. There is little ground for the statement that André Homem's MS. map of 1559 (which, as made at Antwerp, specially interests the author) had set the model for the future mapping of the interior. And the similarities of nomenclature on the coasts between this and the Dutch maps lose their weight when we think that the names are found for the most part on a large number of sixteenth-century maps before André Homem. Surely too it is a pity that Behaim's more than doubtful claim to have been to the Congo with Cao should be accepted without question.

But it is only fair to recognize that the central theme of the work is avowedly the early history of African commerce, and it is of undoubted interest from this point of view. Geographers will at least be grateful to Dr. Denucé for

[1] It is hinted that certain Dutch names in South Africa, such as Mossel Bay, first appeared in 1644—surely a tardy appearance, as they were given by Van Caerden in 1601.

now making the big map generally available, as also for the transcript of the accompanying description of Africa, and for the complete list of places and legends found on the map. The notes on the allegorical representations of Africa current at the time are also of interest to us as giving the source of the African figure in the Society's Hondius map of 1608. It was evidently copied from an engraving by Adrien Collaert, itself based on an earlier one ascribed to Martin de Vos. All three are reproduced, together with another published by De Bry. E. H.

LA FORÊT COLONIALE: les forêts de l'Afrique Occidentale Française. By A. AUBRÉVILLE. (Académie des Sciences Coloniales. Annales. Tome IX.) *Paris: Société d'Editions Géographiques . . .*, 1938. 12×9 *inches;* 244+XVIII *(plates) pages; illustrations and maps.* 100 *fr.*

In this monograph the author, who holds a special appointment as Conservator of Forests, deals with the forests of which he has personal acquaintance, excluding those of Cameroons and French Equatorial Africa. The three main type formations are discussed, viz. Dry Woodland Steppe (Sahélien), Sudan Savannah Forest (which here includes a Sudan zone and a Guinea zone), and Dense Forest, vegetation zones which are also the main climatic regions. Stress is laid on the implications of their physiognomy and distribution, their origin and evolution as well as their present condition. The evidence for a wider extension of forest to the north is accepted, and the historic period is not confused with quaternary conditions (pp. 26–29); but it is clear that the author while admitting much cause for regret and alarm, blames chiefly the human factor for forest retrogression and is not on the side of the pessimists. His view that the present tendency in the north is to an approaching moist cycle rather than to progressive desiccation, is supported by long-period tables of rainfall in Western Senegal and the state of the water table in wells (pp. 30–36), and seems to be confirmed by the Report of the Anglo-French Forest Commission, 1936–37, of which he was a member, and which is quoted frequently in footnotes. If it can be shown that we are now entering upon a comparatively moist cycle with reduction of the dry season, attempts at natural reforestation of existing woodland by simple measures of restoration and improvement, mainly by protection from fire and wasteful cutting, should with time and patience be successful. Planting should be in alternation with the cultivated areas, chessboard fashion, to the benefit of the latter as wind-breaks, etc., and not with the Utopian idea of covering vast stretches of uninhabited regions as a screen against the Sahara and with a climatic effect in view.

Certain species of *Isoberlinia*, *Daniellia*, and others, being gregarious, are suggested as suitable for reforestation in the Guinea zone, especially as they are regarded as vestiges of the original forest which once covered that climatic area. The very diversity of species in the less dense forests, and their vitality and adaptiveness, support the view that these are primary and not secondary formations following fire, etc. (pp. 48–49). The important climatic factors being length of dry season and even distribution of annual rainfall, a dense forest may, given a very short dry season, thrive under a comparatively small total rainfall.

The chapter on Dense Forest (which includes "Rain" and "Deciduous"—map p. 124) occupies nearly one-half of the text, and deals with every aspect: distribution, climatic conditions, former limits, floristic composition, its primary and secondary elements, exploitation, etc. The areas lost to the Dense Forest by fire and deforestation are traced, and the conclusion (against that commonly held) is that the West African forest could not have been in any great degree continuous eastward with the Equatorial except by a narrow coastal

strip in Dahomey, at least within the present climatic period (p. 89). Silviculture and plantation methods are described at length, line-planting (*layons*) being the best for the evergreen and deciduous, but for the more open forests the *taungya* is regarded as the most hopeful (pp. 172–174).

Two chapters on Colonial forest policy and on the Forest Services follow, the present organized service of officers trained for West Africa being apparently comparatively recent. In an Appendix is described an interesting itinerary through the mountainous region of Man in north-west Ivory Coast, which includes Mount Nuon (nearly 6000 feet), one of the Nimba range and probably, apart from Cameroons Mountain, the highest in West Africa. Notes on the types of forest met with, and lists of species with their vernacular names, will interest botanists and foresters alike in a region to which, according to hints in the text supported by several pen drawings, tourists may one day be attracted. There is a bibliography of seven pages; 60 plates, illustrative of the text though rarely referred to therein by number, showing all types from semi-desert to equatorial; but no index, apart from chapter headings. J. M. D.

NORTH AMERICA

RED HUNTERS OF THE SNOWS: . . . thirty years' experience with the primitive Indian and Eskimo tribes of the Canadian North-West and Arctic Coast . . . By PHILIP H. GODSELL. *London: Robert Hale*, 1938. 9×5½ *inches; 324 pages; illustrations and map.* 12*s* 6*d*

This is an interesting account of the life and recent history of the Red Indians, with numerous references to the Eskimo who inhabit the northern coastland of the Canadian continent. Mr. Godsell entered the service of the Hudson's Bay Company in 1906, and he gives one an excellent idea of the changes that have taken place during the past thirty years.

In order to present a more balanced picture, the author has devoted some of the earlier chapters to a brief description of the beginnings of trade, from the close of the sixteenth century. Early settlers supplied firearms to the Iroquois, who were soon spreading terror over a third of the continent; and the French *coureurs de bois*, probing their way westward, often became leaders of bands of retainers, whom they ruled like feudal barons. As the tribes lost their insularity, hundreds of warriors used to descend the rivers to the marts of the white traders. In 1668 the first British fort was established and two years later Charles II granted imperial powers to "the Governor and Company of Adventurers of England trading into Hudson's Bay." As a result of the Seven Years' War, the chain of trading posts along the Great Lakes was transferred to the British. The French *coureurs de bois* were impoverished, but many acted as guides to the Scotch and English traders. Alexander Mackenzie, Peter Pond, and numerous others continued the explorations, and a "North West Company" was soon in bitter rivalry with the Hudson's Bay Company. In 1821, the two companies were amalgamated and peace at last restored.

The author became an adopted member of the Cree tribe, which has always been the bulwark of the northern fur trade. The Crees were at one time comparatively peaceful, but flintlock muskets and a determination to control the trading routes to the English forts soon transformed them into blood-thirsty savages. Their war parties even penetrated the passes of the Rocky Mountains until they came to within 400 miles of the Pacific coast. Subsequently the tribe's geographical knowledge, and its consistent friendship with the white traders, did much to aid the cause of exploration. On account probably of a considerable strain of European blood, the tribe still numbers nearly 20,000.

In spite of four centuries of association with missionaries and other white people, the majority of Indians are still slaves to superstition. The book contains a good account of the Dream Feast, Conjuring Lodges, and such-like ceremonies, as well as of marriage laws, love medicines, and so on. The occult, the practical, and the symbolic are so interwoven that the average medicine-man has been maligned by many writers and given the reputation of being a charlatan and a fraud.

Like the Dog-Ribs and Yellow Knives to the north of them, the Chipewyan Indians have confined themselves more or less to the woods which fringe the Barrens, depending largely upon the caribou for food and clothing. Whenever they venture out into the Barrens, they lack the Eskimo adaptability to make themselves comfortable in a land devoid of trees. The Dog-Rib Indians seem to be the most interesting of the northern tribes. They still preserve the old skin tepee tent, and live a nomadic life, often following the herds of caribou. Fortunately their area, to the north of the Great Slave Lake, was not on the path of the Klondykers. They were therefore saved from the ravages of those diseases which caused so much havoc among the tribes along the Mackenzie river. Although the Indians and Eskimo meet with apparent friendliness within the trading posts, each race merely tolerates the other, their natural enmity being deeply rooted in tradition.

From Fort Macpherson, in the north-west, to Montreal, the search for the pelt of the beaver has given the impetus to exploration, commerce, and discovery. It was, in short, the beaver that made exploration pay. But this was not the case in the polar region that lay beyond the many-channelled delta of the Mackenzie. There the mammoth bowhead whale reigned supreme for a few short years, attracting a horde of adventurers of every creed and colour. The Eskimo were exploited and over two-thirds of them died from disease and liquor. Fortunately fashion came to their rescue, with the declining use of whalebone stays.

The author does not tell the reader much about his travels or life in northern Canada, presumably because the book is already almost too full of information and anecdotes. In fact, it is often difficult to follow the narrative, as one event is apt to succeed another without adequate introduction. Nevertheless the author's sincerity and his obvious sympathy for the people whom he describes are refreshing. He realizes that both Indians and Eskimo alike are hunters and that, unless the game resources are continually safeguarded, they may disappear altogether.

N. A. C. C.

CENTRAL AND SOUTH AMERICA

THE INTERNATIONAL ECONOMIC POSITION OF ARGENTINA. By VERNON LOVELL PHELPS. *Philadelphia: University of Pennsylvania Press—London: Oxford University Press*, 1938. 9½×6 *inches;* xvi+276 *pages; diagrams.* 14*s*

A student of South America might be excused if, on a casual glance at this volume, he turned to more humanistic reading; yet despite the numbers of tables and graphs it is not only a most admirable summary of a complex subject, but topical in that it illustrates another step by the United States Government towards domestic and world improvement by loosening the bonds of nationalism which fetter overseas trade. It is in fact an unofficial study in advance of the field open to such a policy; it reviews Argentina's trade and financial relations with special reference to the U.S. and to Great Britain, her chief banker in the past and customer in the present.

The author is largely concerned with bi-lateralism, that is, the policy of exclusive preferences granted by two countries to each other, as opposed to the former "unconditional most-favoured nation" policy, whereby any concession or restriction imposed on the trade of one country applied automatically to all. This is still the policy of the United States, which as a manufacturing as well as producing country is interested in expanding overseas markets and opposed to exclusive treaties, using that word in its literal sense. Bi-lateralism moreover is not solely confined to Custom tariffs. Lately there has been superimposed on these a system of quotas limiting not only the exchange of actual goods, but the means of paying for them. Such systems react adversely on international trade and on the currency credits which are its life-blood. Here the writer walks warily, for he deals with gold, both as the basis of currency and as a reserve against adverse trade balances. Again he is concerned chiefly with the United States, Great Britain, and Argentina triangle, which are all democratic and gold bloc countries.

Mr. Phelps reviews first Argentina's growth at home and relatively to South America, concluding that in view of her actual and potential fertility, expanding population, wide territory, and political ideals, closer relations with the U.S. are desirable and desired by both countries. That Argentina's foreign loans and her international trade have advanced *pari passu* is accepted as proof that, on the whole, such borrowing has been well applied. In 1934, the last complete figures available, Argentine foreign indebtedness totalled 4300 million gold dollars. Of this Great Britain's share was 54 per cent.; that of the U.S.A. only 13 per cent.

Loans and investments overseas may accompany, facilitate, or in certain cases compel trade, but they are not in themselves the income by which nations, like individuals, live. Argentina's bi-lateral exchange preferences and quotas, first given effect in the Roca-Runciman treaty of October 1933, have since been applied to thirteen other states, American and European. Great Britain absorbs roughly one-third of Argentina's total exports, chiefly of meat and grain, and the credits so formed are at the disposal of the British merchant who pays the "official" as opposed to the "free" exchange rate, with a resulting real preference of 20 per cent. on goods thus sold. Within these limits, what the British investor has lost is recouped by the British merchant. This inferior position, argues Mr. Phelps, cannot be remedied unless America in her turn purchases more Argentine products, which will increase the official exchange available for U.S. shippers. The problem for the U.S.A. is how to increase Argentine credits while preserving the "most-favoured nation" clause insisted upon by the American Senate. The author advocates that the U.S. tariffs be reduced, under provisions of the U.S. Treaties Agreement Act of 1934, whereby concessions may be granted on articles produced in any country, of which that country is the chief source of supply. These simple proposals may appear modest, but Mr. Phelps is obviously nervous of any reduction of the U.S. tariff which may antagonize the farmers. However political expediency may ultimately decide, the preliminary fact-finding for a U.S.–Argentina treaty lies in the volume before us.

Seven pages of bibliography indicate the interest taken by the U.S.A. in South America. The value of the tables must diminish with passing years, but Mr. Phelps has done his work so thoroughly that others can make 1934 the starting point for future studies. The writer notes with regret the use of that irrepressible hybrid "Argentinians." Why not, simply, "Argentines"?

W. S. B.

POLAR REGIONS

THE MARION AND GENERAL GREENE EXPEDITIONS TO DAVIS Strait and Labrador Sea, under direction of the United States Coast Guard, 1928–1931–1933–1934–1935. Scientific results. Part 2: Physical oceanography. By EDWARD H. SMITH, FLOYD M. SOULE and OLAV MOSBY. (U.S. Treasury Department. Coast Guard. Bulletin No. 19.) *Washington*, 1937. 9½×6 *inches;* vi+260 *pages; charts and diagrams.* 75 *cents*

The authors of this report have made numerous calculations, founded on Bjerknes' theorem, of the transport of water and heat by the currents and have been led to conclusions on the circulation which differ in many ways from opinions hitherto held. The West Greenland Current is considered to lose so much of its East Greenland characteristics by admixture with Atlantic–Irminger water soon after leaving Cape Farewell that it must be looked upon as an entirely different current. It fans out westward continually as it flows northwards, and not more than 15 per cent. of it reaches the Davis Ridge. Part of this passes over the Ridge on the Greenland side and carries bergs northwards to Melville Bay, taking part in the general cyclonic circulation of Baffin Bay.

In the past it has been customary to apply the name Labrador Current to the whole of the flow on the American side, from Smith Sound to the Grand Banks. According to the calculations of transport it receives just south of Davis Ridge a contribution from the West Greenland Current which more than doubles the volume. The authors have therefore called the northern part of this current the Baffin Land Current and reserve the name Labrador Current for the part south of the ridge. The speed of the Labrador Current varies from 5 miles to 38 miles a day along its course and is divided into two bands. The inner band carries pack which keeps the bergs in the outer band in deep water where there is little chance of their grounding, and so affects the number reaching the steamship lanes.

The volume of the Labrador Current appears to vary with that of the West Greenland Current. In 1931 a large part of the latter branched away from the land near Cape Farewell. This would entail a small transport of heat to the Disko region and therefore perhaps a diminution in the number of bergs set free. It is remarkable that in that year only 13 bergs came south of Newfoundland. The average is 420.

The authors discuss the origin of the cold bottom water of the Labrador Sea, and conclude that it is formed by cooling at the surface during the winter, with admixture below the surface with the saltest part of the sinking branch of the West Greenland Current.

The report is a valuable contribution to the oceanography of the region, and is very fully illustrated. But it may be asked whether it is safe to calibrate a conductivity bridge directly against Copenhagen standard water which has been long sealed up in glass and must contain some of the constituents of the latter in solution, probably in varying amount? Should not a recently prepared and titrated secondary standard be used? D. J. M.

HELL ON ICE: the saga of the "Jeannette." By Commander EDWARD ELLSBERG. *London: William Heinemann*, 1938. 8½×5½ *inches;* x+366 *pages; illustration and route-maps.* 12*s* 6*d*

Until recently it has been customary in accounts of expeditions to describe in detail the programme of work with its accompanying hardships and pleasures, but to refrain from mentioning the discords and unpleasant interludes. In the case of this book however various factors combine to give a very realistic, though

a little romantic account of the expedition of the steam barque *Jeannette*, which in 1879 set out to reach the North Pole by way of the Behring Sea. Written some sixty years after the event by an author in no way connected with the expedition, and based mainly on the very full diary of Chief-Engineer Melville, this book contains a frank account, not only of the physical suffering endured, but also of the unpleasant atmosphere created by the clash of opinions between the civilian scientists and the service members who comprised the rest of the expedition.

The members of the expedition suffered hardships enough without having to live in the company of men who refused either to speak to, or cooperate with, their colleagues. For in the first winter, 1879–80, they were trapped in the ice in the disappointingly low latitude of 71° N., and in October 1880, Captain de Long and his men prepared to spend a second winter in the ice. This time however the *Jeannette* did not escape; she was crushed in the ice and sank in lat. 77° N. Officers, scientists, and men were obliged to sledge and boat under the most gruelling conditions some 500 miles to the Siberian coast. In the Lena delta, instead of the longed-for security of land, they found huts that were deserted, tundra devoid of life, and numerous rivers in the process of freezing up. Only Lieut. Melville's party and two others survived to tell the tale.

The book is written as coming from the pen of Chief-Engineer Melville, and by reason of his senior position we get a good insight into the thoughts of Captain George de Long, who carried out his unenviable task in a very determined and noble fashion. It is surprising however to read of the Captain carrying only the ship's records, whilst the men are sledging under back-breaking conditions. Nor can one sympathise with a scientist who refuses to obey orders, even when the whole company's lives are in danger. These factors however add to the human interest and help to provide a vivid description of difficulties that had to be overcome with apparatus and gear that the modern explorer would never dream of using, giving once again, just cause for revering the early pioneers of polar exploration. A. S.

PHYSICAL AND BIOLOGICAL GEOGRAPHY

PALAEOZOIC FORMATIONS IN THE LIGHT OF THE PULSATION

Theory. By AMADEUS W. GRABAU. Vol. III. Cambrovician pulsation. Pt. ii. Appalachian, Palaeocordilleran, Pre-Andean, Himalayan and Cathaysian geosynclines. *Peking: The National University Press* [*Agent: Henri Vetch, The French Book-store*], 1937. $9\frac{1}{2} \times 6\frac{1}{2}$ *inches;* xxx+850 *pages; illustrations and maps.* 20*s* (*postpaid*) *in Great Britain and Colonies*

Careful study of the manner in which marine strata lie one upon the other shows that over wide areas deposition of material on the sea-floor was interrupted at intervals. Such interruptions clearly correspond to times when the waters withdrew from the margins of continents, exposing the sea-bottom before the next reinvasion. Judging from present-day observations, these advances and retreats of the shore-line have generally been slow processes measured in periods of many thousands of years.

At the time of the XVI International Geological Congress in 1933 Professor Grabau arrived in Washington from Peking to enunciate a new theory of the control of marine sedimentation. Since then he has been occupied in working out its application in detail. From a careful comparison of formations in different parts of the globe, he finds that the combination of marine invasion and retreat forms a sounder basis for subdividing the geological column than the current classification by periods. Further, he claims that the major resulting sedimentary

overlaps and offlaps have been more or less simultaneous all over the world, and hence due primarily to rise and fall of sea-level rather than to localized movements of the Earth's crust. This oscillatory eustatic rise and fall constitute the pulse-beat in terms of which geological history is to be measured. Instead of the seven Palaeozoic systems we would now have fourteen pulsations.

Although possible causes of such pulsations are considered, Grabau's main attention is directed to an exhaustive comparative study of the geological record in all parts of the globe in an effort to establish the phenomenon as a fact. The entire first volume of 700 pages was devoted to the Lower and Middle Cambrian deposits alone—Grabau's Taconian and Acadian (or Cambrian) Pulsations, respectively. Volumes II and III deal with the third pulsation, which covers the marine advance of Upper Cambrian times and the subsequent retreat in Lower Ordovician—the Cambrovician Pulsation, to use Grabau's new hybrid term—spanning the transition between the periods.

The industry shown in this monumental work, drawing on the findings of stratigraphers of all lands in a dozen languages, is amazing. Thus far, 2300 pages bring the story only from the base of the Cambrian to the top of the Lower Ordovician. The Cambrovician of Wales and Ireland receive 100 pages. The corresponding section on England and south Scotland occupies 55 pages, and is followed by a useful summary of the sequence of events during that marine oscillation, as Grabau interprets them.

His thesis is sure to be sharply challenged, as many of his scientific ideas have been when first mooted, and not only by those who regard the novelty of an idea as proof positive of its falsity. At a meeting of the British Association in Glasgow there were those who questioned the claim of the Permian system to recognition. Many whose observations have been limited to relatively small elements of the Earth's surface will be horrified at what seems like taking unwarranted liberties with a long-established classification. Grabau himself would be the first to admit that many points of detail may call for modification later. But the main thesis of the work cannot be rejected at sight merely because interpretations of certain points are not acceptable, and we may well be grateful for any challenge to accepted ideas if it leads us to reconsider their validity, especially if in so doing we are forced to alter our preconceptions to a nearer approximation to the truth. Those who remain unconvinced will still value the book for its service in bringing together such a wealth of data. And one can have only admiration for any one who is struggling to put a fourth volume through the press amid the harassing surroundings of Peking. G. B. B.

ECONOMIC AND HISTORICAL GEOGRAPHY

TERRAE INCOGNITAE: eine Zustammenstellung und kritische Bewertung der wichtigsten vorcolumbischen Entdeckungsreisen . . . Band III. (1200–1415 n. Chr.) *Leiden: E. J. Brill*, 1938. 10×6½ *inches;* x+390 *pages; illustrations. Gldr.* 6.00

The third volume of Dr. Hennig's comprehensive work illustrates the history of exploration and commercial intercourse from A.D. 1200 to the early years of the fifteenth century, the threshold of the age of expansion. This period is characterized by the opening of Central Asia to western travellers during the Mongol domination, and the missionary activities of the Roman Church in Africa and Asia. He has therefore to deal, naturally only briefly, with the great journeys of Carpini, Rubruk, and Marco Polo, as well as with lesser-known travellers.

In the west he is concerned with the last Norse exploits, and argues strongly

for the authenticity of the Kensington stone in Minnesota. Regarding the discovery of the Atlantic island groups, he upholds the priority of Lanzarote, then a Genoese subject, in the Canaries, placing his expedition in about 1312, and the completion of the discovery in 1341. Rejecting the Macham tradition, he believes that the Madeira group was discovered by Italian sailors in 1345. On the other hand, he rejects, largely upon his interpretation of the place-names, a fourteenth-century discovery or the Azores. The origin of the island names Corvi marini and San Zorzi, which are found on charts of that century, remain however unexplained. The author appears to consider that they were originally mythical, and were deliberately given to islands in the Azores at the end of the following century. In a work of this scope there are bound to be points which might be questioned. Ghana is mistakenly identified with Gao, and the description quoted from Edrisi on p. 346 applies to the former. Tabelbert should be distinguished from Sigilmassa. Fra Mauro's map has other than purely literary sources. The Southern Cross was drawn in that shape a number of years before 1510. G. R. C.

THE SHERLEIAN ODYSSEY: being a record of the travels and adventures of three famous brothers during the reigns of Elizabeth, James I, and Charles I. By BOIES PENROSE. *Taunton: The Wessex Press* (*London agents: Simpkin Marshall*), 1938. $8\frac{1}{2} \times 5\frac{1}{2}$ *inches; 290 pages; illustrations and route-map. 12s 6d*

During recent years important contributions have been made, by Sir Denison Ross, Professor Babinger, and others, to the literature which has grown up round the adventures of the three Sherley brothers. These contributions however have dealt with one or other brother in particular; and Mr. Penrose has now reviewed the whole subject afresh, fitting the new facts into the old knowledge. He is evidently well acquainted with all the sources, and in addition has supplied an adequate background of contemporary history. Moreover, he makes his own contribution, by printing as appendices a number of documents, the most important of which is a series of eleven letters (from or to Anthony Sherley) in the State Archives at Vienna. He writes sensibly and dispassionately, and makes no attempt to gloss over the unscrupulous self-seeking which appears to have been the chief characteristic of this remarkable trio of adventurers.

The book is provided with ten illustrations and a coloured route-map. The resources of a provincial press may have proved unequal to the task of providing the usual marks for contractions in some of the quotations; but in that case it would have been better to extend the contractions for the benefit of the reader. We may also suggest that in any future edition the punctuation might be revised with advantage, and the author might reconsider the translation of a passage on p. 133, which suggests that a letter of credit should be "sent by registered mail." W. F.

THE STRUGGLE FOR IMPERIAL UNITY (1868–1895). By J. E. TYLER. (Royal Empire Society Imperial Studies. No. 16. General editor: A. P. NEWTON.) *London: Longmans, Green and Co.*, 1938. $9 \times 5\frac{1}{2}$ *inches;* viii+220 *pages. 12s 6d*

This study deals with the struggle for unity among the self-governing parts of the empire during the period between the decline of mid-Victorian "anti-imperialism" and the appointment of Joseph Chamberlain as Colonial Secretary in 1895. The author shows how the development of imperialism in the 'seventies and 'eighties was influenced by such political factors as the rise of Germany and the growth of foreign imperialism, and by such economic factors as depres-

sion and the improvements in communications. In connection with the economic factors a false importance appears to be given to 1868 as the beginning of a depression more usually ascribed to 1873, a conventional date which has more than convention behind it. This revived imperialism was adopted as a party policy by Disraeli. Such an adoption may have been brilliant opportunism, though Mr. Tyler holds, without giving much real evidence for his view, that Disraeli's imperialist sentiment had deeper roots than a mere desire to "dish the whigs."

The new imperialism brought with it a new desire to promote imperial unity. This was characterised by the activities of the Imperial Federation League of which there is a long and valuable account. The League's outstanding achievement was the summoning of the first Colonial Conference in 1887. Mr. Tyler gives a full analysis of this Conference and brings out what he describes as its "unique importance." Federation however could mean many things. Canada, influenced by her proximity to the United States and by the presence of the French Canadian minority, was interested chiefly in imperial preference. Australia, with her problem of internal federation and her relationship to the rest of the Pacific, laid greatest emphasis on imperial defence. South Africa, too, had domestic preoccupations and despite Hofmeyr's part in the Conference of 1887, scarcely showed any desire for a rigid federation. These differences of opinion were reflected in the League itself which became divided on the questions of imperial preference and defence. The former conflicted with the free trade policy of successive British governments, and it was the latter which was emphasized in proposals laid before Gladstone by the League in 1893. Gladstone treated the proposals with courtesy, but it was the courtesy of the undertaker. With its proposals decently buried, the League, torn by internal dissensions, succumbed.

Although some of the plans of federation have now a slightly academic air, they serve to remind an age that has seen the rise of an imperial "common partnership" of those earlier and different attempts to solve the problems of imperial unity. This well documented study is therefore a valuable contribution to the history of British imperialism in general and of imperial unity in particular.

T. S. W.

OUR DAILY BREAD: a geography of production. By Sir DANIEL HALL. *London: John Murray*, 1938. 8×5 *inches;* x+170 *pages; illustrations and maps.* 6*s*

This small but competent book, which was written primarily though not exclusively for school children, is a lucid and readable account of the many different kinds of farming which contribute to the food supply of Britain. The problems which the author unravels concern the origin of our food and drink. A great deal of information is brought together about the technique of farming, the geographical conditions under which production is carried on, and the statistics of production. The extent to which grain, vegetables, milk, and meat are home-produced, or imported either from foreign or imperial lands, is emphasized throughout. A praiseworthy feature of the book is its illustrations: the different types of pig, sheep, and cattle, the difference between the sickle, scythe, fagging hook, and mattock, the coffee plant, and what is alleged to be the first illustration of the potato plant are all shown. Distribution maps are given of milch cattle, sheep, acreages of wheat, and so forth, but they relate only to England and Wales, and are complicated by obscure open circles, of which no explanation is given. Diagrams of loaves of bread, sheep, and sirloins of beef show the proportion of our food produced at home or imported from

countries oversea, but the proportions are occasionally inaccurate and misleading, as on pp. 128 and 129. The last section of the book, entitled 'The beginnings of farming,' is not the best part of it, and it is a bad error (on p. 161) to ascribe the introduction of grain cultivation into Britain to Roman or post-Roman times. W. G. E.

GENERAL

TOMBS, TRAVEL AND TROUBLE. By LAWRENCE GRISWOLD. *London: Robert Hale*, 1938. 9×5½ *inches;* xii+338 *pages; illustrations.* 12*s* 6*d*

If Mr. Griswold hopes to have his writings taken seriously he is unwise in adopting a style sometimes perfervid and at other times jocular and boastful; in remaining not only vague but frequently incomprehensible as regards geographical detail, as well as dating; and in totally ignoring maps and documentation.

A sentence on the first page is characteristic. "Even the names . . .—Tiahuanacu, Cambodia, Guatemala, Yucatan—were appealingly strange and reeked of romance and undisclosed information." He states that his adventures cover a period of sixteen years and a distance of 400,000 miles, and he refers to himself as an archaeologist and a scientist: the present pages do not substantiate any one of these claims. A number of Mr. Griswold's itineraries appear not only unconvincing but absurd. In chapters 3 to 5 he describes a journey in the Republics of Panama and Colombia. His objective was a spot "near the Colombian frontier" where a stone stairway had been seen: it was, he thought, of Maya origin, since nearby "Mayan stela (*sic*) had been discovered." This is incorrect; no Maya remains occur within many hundred miles of Colombia.

From the Atlantic side of the Isthmus he crossed to Panama City, and thence by road to Chepo. Shortly afterwards, on foot, he crossed the Cordilleras to the Atlantic side again. Here he found Indians who were "rather tall for Miskitos." Mr. Griswold thought that he was now on the Miskito Coast (p. 39), and among cannibalistic head-hunters: but he was safe, he says, because he spoke their language and knew their tabus. From this vague region on the Panama north coast the party cut their way through jungle at the remarkable rate of 12 miles a day; and after a journey of unspecified length emerged almost at the foot of the stairway. From the camp established here Mr. Griswold got in touch with "Arraijan, the nearest native town, about 12 miles away" (p. 46). The only Arraijan known to map-makers lies some 200 miles west of the Canal Zone. Later however the party established relations with a banana grower who shipped his products to Puerto Colombia, some 250 miles north-east of the Panama–Colombia frontier. Where was the stairway? Apparently, Mr. Griswold had reached a point within reach of the Magdalena river, yet does not mention crossing the Chucunaque, Atrato, Sinú, or Cauca rivers. It seems unnecessary to inquire why, in such a situation, he should have cut his way, returning south-west, through jungle to Turbo, which lies far back in the Gulf of Urabá: or to follow his further adventures among the head-hunters of Ecuador and the "dragons" of Komodo Island. L. E. J.

THE MONTHLY RECORD

THE SURVEY OF NORWAY

The current (1937) report on the work of *Norges Geografiske Opmaaling* confirms the impression that the Geographical Survey of Norway is a vigorous institution carrying out work that combines the academic values with a strong sense of the practical requirements in map making. The printing of maps does not comprise the entire work undertaken, for from the same office come those charts which, with the clear style of printing and the many clearly indicated coloured light-sectors, are such good guides to the skerry-strewn sounds and fjords of the Norwegian coast.

The present report is encouraging in showing an increase in the sale of maps and indicating that the general policy both in survey and printing is up to date. Under a scheme of co-operation with Germany maps are to be started of the ice-cap and glacier regions which will be of especial value to geographers and tourists. An extensive use of photogrammetry will increase the rate and cheapen the costs of the formal mapping of sparsely populated country. The budget shows a *pro capita* contribution rather above that received by the Ordnance Survey.

M. A. S.

NORFOLK COAST FLOODS OF 1938

In the *Meteorological Magazine* for May 1938, Dr. J. N. Carruthers discusses the Horsey floods of February 1938 in relation to wind and current observations on six lightvessels in the North Sea, Straits of Dover, and eastern end of the Channel.

On the evening of February 12 the sea burst over the low-lying coastland between Winterton and Palling in Norfolk, flooding farms and marshes over an area of about 15 square miles. The flooding was due to wind-induced deepening of the waters of the southern North Sea at a time when the tide would have been high if not affected meteorologically. An already high water-level was markedly raised by strong winds from the north-west quadrant causing a ponding-up of water which could only be relieved by escape through the Straits of Dover. The sea broke through the sandhills about 48 hours before full moon and four days before the highest predicted water-level, due on the night tide of February 16. The prediction for Dover was 17·2 feet for high water on the night of February 12, whereas that for midnight February 16 was as high as 20·0 feet. By this date however the north-westerly gale responsible for the inundation had fortunately subsided, otherwise much more serious damage on the Norfolk coast would have been inevitable. On February 12 the night tide at Dover was 5 feet in excess of prediction; at Southend the night high-water was nearly 6 feet in excess and the crest was an inch above that of 6–7 January 1928, when many lives were lost along the Thames embankment in London. Across the North Sea at the Hook of Holland similar conditions prevailed, the high- and low-water excesses over predicted values being 6 feet 6 inches and 2 feet 9 inches.

The distribution of the six lightships is given in a sketch-map and the wind and current observations taken aboard are analysed. The flood and ebb tidal stream records indicate a complete reversal at the time of the normal net flow of water from the English Channel to the North Sea. At the Sandettié vessel between Deal and Calais in the narrowest part of the North Sea in place of a water transport north-east at the rate of $1\frac{1}{2}$ miles a day there was a transport in the opposite direction approaching $15\frac{1}{2}$ miles a day, and as far distant as

the Horns Rev off the Danish coast there was a reversal of the normal direction of flow.

On April 3 a second breach of the sea defences occurred at Horsey, on this occasion at the time of highest predicted tide, due to be 2 feet higher than that of February 12. As however the following tides were due to be less, the associated wind conditions were potentially less dangerous than in February. Records from the Cromer Knoll lightship, the Varne in mid-Straits, and the Royal Sovereign off Bexhill indicate as before reversals of the normal direction of the tidal currents.

THE CHIRUS OF THE MANIPUR VALLEY, ASSAM

The economic and social life of the Chirus, a Kuki tribe of the Manipur valley, Assam, is described by Tarak Chandra Das in a contribution to *Anthropos* (vol. 32 (1937), 440–9), a reprint of which we have received from the author. The basis of their economy is agriculture; they do not hunt for subsistence; fishing is incidental to the cultivation of the paddy-fields, and they trade mainly that they may be able to pay the house-tax. They do not appear to collect wild roots or fruits. The older form of agriculture is that of jhum-cultivation in the hill forests. Every village has its well-defined jhum area, in which each villager is at liberty to clear a patch, over which he exercises rights until it is left to lie fallow again. A plantain-jhum is usually cultivated for seven years, a paddy-jhum for three. The period of fallow is generally twelve to fifteen years. In addition many of the villages cultivate land in the valleys, where the plough can be used. This appears to be a comparatively recent innovation, and here the land is held on permanent tenures. The strength of earlier traditions has prevented the establishment of villages in the valley. This development is producing marked social effects; in the hills, the village is the predominant authority; the introduction of permanent tenure in the plains has substituted the family, and placed the house-father in authority. Thus the bachelor's house, equality of individual rights, and the setting-up of independent households after marriage, are disappearing, and social disintegration is setting in.

NATIVE INDUSTRIES OF NIGERIA

We have received a copy of *Nigeria*, a quarterly magazine, which, though published by the Education Department, Lagos, is an unofficial publication dealing with matters of general interest in Nigerian life. The June number is devoted to a rapid well-illustrated survey of Nigerian arts and crafts. It contains brief articles on the present state of native pottery, weaving, embroidery, wood carving, bead and leather work, and brass casting. All these industries, in competition with imported products, are in danger of dying out unless public support is forthcoming. A plea is made for the greater employment of native craftmanship in public buildings, and also for the provision of museums. Unless adequate steps are taken, there is considerable danger that no comprehensive representation of the former achievements of Nigerian craftsmen will survive in their own country. Short accounts are given of the recent discovery at Ife of seven remarkable bronze heads, and of the great collection of over seven hundred stone figures excavated at Esie, Ilorin province, four years ago. A Central Nigerian museum, with local museums at Ife and Benin, where valuable treasures are exposed to the danger of destruction, would be the first step to preserving a record of Nigerian artistic development, and to arousing among the people an interest in their past.

POPULATION AND SETTLEMENT IN BRAZIL

The *Geographical Review* for July contains three articles dealing with settlement and population in Brazil. The first, by Professor P. T. James, examines

recent changes in the distribution of population in the State of São Paulo. Destructive exploitation has characterized the treatment of natural resources, resulting in the rapid shifting of the rural population and a striking contrast between the countryside and the great cities. A comparison of the census figures for 1920 and 1934 reveals great changes on the frontier zones of the state. In the first half of the period large tracts were cleared and planted with coffee trees, and the boom attracted large numbers of immigrants from other parts of Brazil and overseas. With the collapse of the coffee market, cotton became the attraction in the west, and by 1935 the number of workers engaged had risen to 250,000 (30,000 in 1932) mostly settled on hitherto undeveloped land around Marilia. The share of Japanese immigrants in this advance has been considerable; most of those entering Brazil went directly to the Marilia area, and by 1934 Japanese formed 18 per cent. of the population of São Paulo state, and though occupying less than two per cent. of the agricultural land, were raising 46 per cent. of the cotton crop, and 30 per cent. of the total agricultural production. Another striking feature is the growth of the city of São Paulo in the fourteen years from approximately 580,000 to over one million inhabitants. Many landowners sold their estates to smallholders and invested in new industrial developments in the city; market-gardening developed in the neighbourhood, and a large proportion of immigrants remained there in preference to the country. Another area of increase lies around the city of Santos, where orange and banana plantations have developed. The chief area of declining population was the coffee fazendas, particularly in the Parahyba valley, owing to the attraction of the cotton plantations and the cities. In the areas of recent settlement, the centres are related to the development of communications; elsewhere, settlement preceded the railways, and important junctions are still undeveloped economically, largely on account of the small internal traffic of rural Brazil. The relatively small population of the State is due in part to historical causes favouring the fazenda with its landless labourers, but so long as the immigrant is seeking immediate profit either in the cities or in the speculative single crop areas, an agricultural population attached to the soil will not evolve. The same factors are seen at work in the analysis of the origin and growth of Brazilian towns contributed by Professor P. Deffontaines. Brazil is a country of dispersed habitations with an astonishing development of towns. The triumph of the fazenda over the reducción was the first step in population dispersion. Military requirements, mining areas, roads, waterways, and railways have all at times contributed to the establishment of towns, but the fluctuation of the importance of these factors has led to the semi-abandonment of towns before their full development, and to the establishment of other ephemeral centres: "the very instability of the towns is the cause of their multiplicity." A more permanent element perhaps are the lay patrimonios, a development of the ecclesiastical type, founded by a fazendeiro or a land development company to meet the needs of a particular area. In his article on the drought region of north-eastern Brazil, Dr. F. W. Freise shows that the causes are unreliable distribution of rainfall in time and place, and the difficulty of utilising the water that falls. In the past, owing to the heavy drain on the population of the north-east following the discovery of minerals and precious stones in the central plateau, and the introduction of coffee-growing in São Paulo, the need for dealing with the problem was not pressing. After 1880, however, various schemes of dam construction were begun, but only in 1910 were measures taken to obtain accurate data. Fifty-six reservoirs, with a capacity of 621 million cu. m., and twenty-five municipal reservoirs, have now been completed, and about fifty thousand hectares should be irrigated in the near future.

THE SUPPOSED LAND TO THE NORTH-EAST OF GREENLAND

Dr. Lauge Koch set out on May 10 of this year from Kings Bay, Svalbard, on a flight to Greenland, primarily to ascertain whether land existed north-east of the Northeast Foreland of Greenland. The observations of members of the 1907 *Danmark* Expedition, Lauge Koch's own observations while flying in 1933, the movement of ice and the evidence of soundings had suggested that there might be some low undiscovered island or group of islands in the sea between Greenland and Spitsbergen. In December 1937 the Russian party sent a message from their drifting ice floe with a much more definite indication of the existence of land.

Dr. Lauge Koch's flight was made in a Dornier-Wal flying-boat. Almost to the day thirteen years earlier two older Dornier-Wal machines left Kings Bay with Amundsen and Ellsworth, bound for the North Pole and Alaska. They returned three weeks later, having experienced a forced descent in the polar ice from which they only freed themselves by continuous and exhausting labour. This year Dr. Koch made two flights to Greenland, one on May 10 and a second on May 15, resulting in considerable improvement in the map of north-east Greenland and disproving the existence of the supposed land. The second flight lasted nearly 12 hours and covered the whole of Peary Land. It was discovered that J. P. Koch Fjord and the Wandel Lake are parts of a depression which cuts off Peary Land from the Greenland ice-cap. Both J. P. Koch Fjord and Frederick E. Hyde Fjord are much longer than hitherto supposed. The pack was not met with until some 200 miles west of Spitsbergen, a fact which caused meteorologists to predict a northern path for this summer's Atlantic depressions. M. A. S.

THE POLAR RECORD

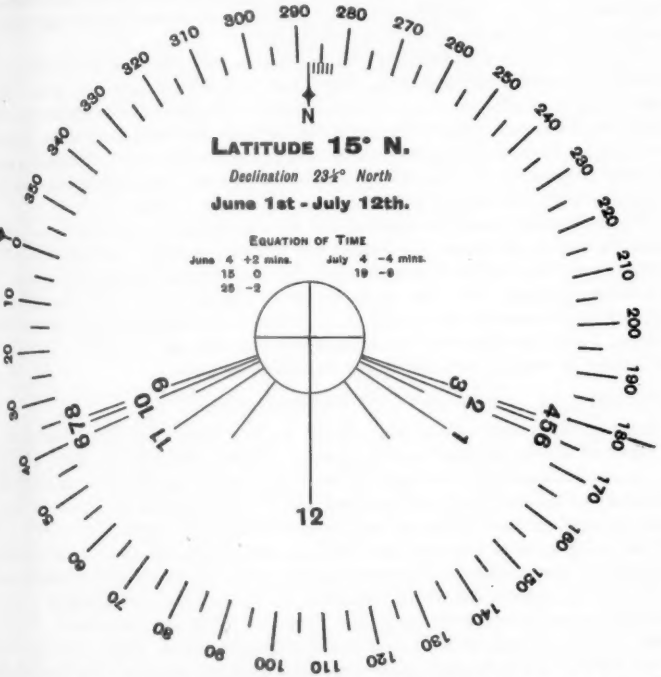
A development in the editorial policy of *The Polar Record* is announced in the July number. In the past occasional articles have been published on the technique of polar travel; it is proposed to make these a regular feature of the journal. The July number contains an article of this type on snow-house building by Mr. Graham Rowley, who was a member of the British Canadian Arctic Expedition, 1936–7. Further articles are planned on foot-gear, fuel, and rations, and on features of the Polar environment, such as sea-ice and icebergs. Questions of this kind are largely a matter of personal experience and opinion, and conditions also vary from region to region; it is proposed therefore to publish the opinions of other Polar travellers in subsequent numbers. In this way the *Record* will preserve for their successors the experience of recent Polar expeditions.

The main purpose of the *Record* is to chronicle all Polar news, and special attention is given to the plans and progress of expeditions, with a list of their members. The number of expeditions from many countries which now visit the Arctic each year makes it difficult to follow their activities and the work accomplished. The *Record*, the sole publication where these details can conveniently be found, is therefore a useful reference work for students of Polar exploration. Short articles are also published; in the July number Dr. A. Hoel deals with coal-mining in Svalbard (2650 men wintered there in 1937–8, and over 740,000 tons of coal were exported last year), and Mr. J. Colman discusses the Newfoundland seal fishery and its possible influence on the Greenlanders. *The Polar Record* is published twice a year, price two shillings a copy, by the Scott Polar Research Institute, Cambridge.

A DEVELOPMENT OF THE SUN COMPASS

The Deputy Surveyor-General of Egypt, Mr. F. S. Richards, has kindly sent us specimens of a sun compass devised by Major Evans-Lombe. It differs

from Major Bagnold's sun compass manufactured by Messrs. Watts in that it is not in itself an instrument, but rather a number of cards which can be assembled, or copied in metal and assembled, to make a sun compass. Major Bagnold's design was developed during journeys of exploration in the Libyan desert; it is described in 'Hints to Travellers,' vol. I, p. 147, and has shown itself excellently suited to the needs of the explorer. But its use demands a knowledge of Azimuth Tables and frequent re-setting, even when steering a straight course. The E.L. compass dispenses with these difficulties by means of a multiplicity of cards for certain belts of latitude and periods of time.



The course being steered is 287½° true if the shadow of the pin at the centre falls on the radial time line corresponding to local apparent time, and the 0–180° line is set fore and aft

Two cards or discs, an upper and a lower, are used in conjunction. The lower one being of greater radius may be thought of as the outer one; it is a circle divided in degrees figured counter-clockwise which is set up in the vehicle with the 0–180 degrees line running fore and aft on a levelled table. A gnomon, consisting of a knitting needle, is set perpendicularly at the centre of the disc. The upper disc is the inner disc by virtue of being smaller than and within the disc already described. It has a north point and a certain number of radial lines marked with hours, so drawn that if the shadow of the gnomon falls along the line corresponding to the local apparent time, then the north point indicates true north.

For a belt of latitude 4 degrees wide there are 16 cards for the year. At the limit of this belt errors of direction during the morning and evening would probably rarely exceed 2 degrees. The cards can be used as they are, held down by a sheet of celluloid; or they may be mounted on metal discs, or, best of all, the work can be copied from the cards and engraved on metal by native craftsmen.

To set a course the north point of the inner card is set to the true course on the outer card and the car is turned so that the shadow of the gnomon falls on the line, or at the proper place between the lines, corresponding to local apparent time. The crew require to know the latitude, and to find the local apparent time from the Standard Time, the longitude difference from the Standard Meridian, and the Equation of Time; the latter is printed on the appropriate card for the date and latitude.

The best results are obtained when a "navigator" sits next to the driver; he devotes his whole attention to the sun compass and keeps a record of the deviations made from the set course by watching the shadow of the gnomon on the outer, or protractor, card. Allowance can be made for those deviations, necessitated by local obstacles, so that course is regained on the correct line when open country is reached. In this way journeys have been made across the desert of 100 miles with a closing error at the end of less than 1 mile.

To summarize the advantages of the E.L. compass: (1) it can be copied in brass by native workmen; (2) it need not be reset during a comparatively long journey provided course is not changed; (3) it can easily be checked against the prismatic compass. But for explorers who change their latitude and local time by large amounts the multiplicity of discs required would be an encumbrance. Such travellers will be acquainted with the use of Davis' Tables and will prefer to employ as hitherto the Bagnold compass. M. A. S.

HISTORICAL ASSOCIATION PAMPHLETS

Among the recent pamphlets issued by the Historical Association are a number of direct interest to geographers. Those published in 1937 included Dr. J. A. Williamson's 'Voyages of John and Sebastian Cabot'—an admirable summary of this involved subject, and Mr. F. G. Emmison's 'Types of Open-field parishes in the Midlands,' which is "an attempt to explain briefly some of the topographical and economic aspects of the agrarian lay-out of Midland parishes, and to distinguish between various types of open-field arrangements." In the first pamphlet issued for 1938, Mr. J. N. L. Baker deals briefly with the elements of medieval trade and then describes the more important medieval trade routes. Three useful sketch-maps are included. The latest number of the series, 'Guide to periodicals and bibliographies dealing with Geography, Archaeology, and History,' was planned by a Joint Committee on which the Society has two representatives, and is in part the work of one of these, Professor E. G. R. Taylor. Its chief purpose is "to indicate sources of information regarding current work in Geography, Archaeology, and History, with a view to facilitating study in the zones of overlap between the three subjects." The list is mainly concerned with publications in English, but a number of foreign references are given. The sections on Archaeology and History have been contributed by Miss E. Jeffries Davis. These pamphlets are published for the Association by G. Bell and Sons, Ltd. They afford welcome evidence of a growing recognition of the interdependence of these three subjects.

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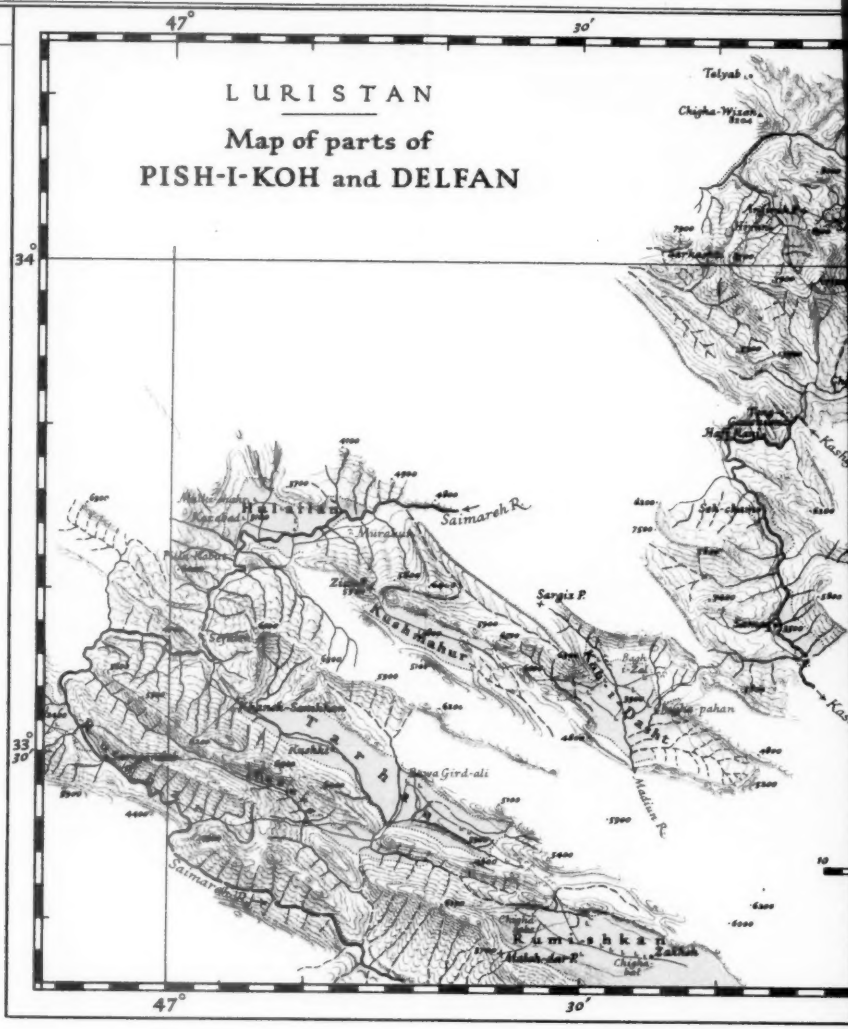

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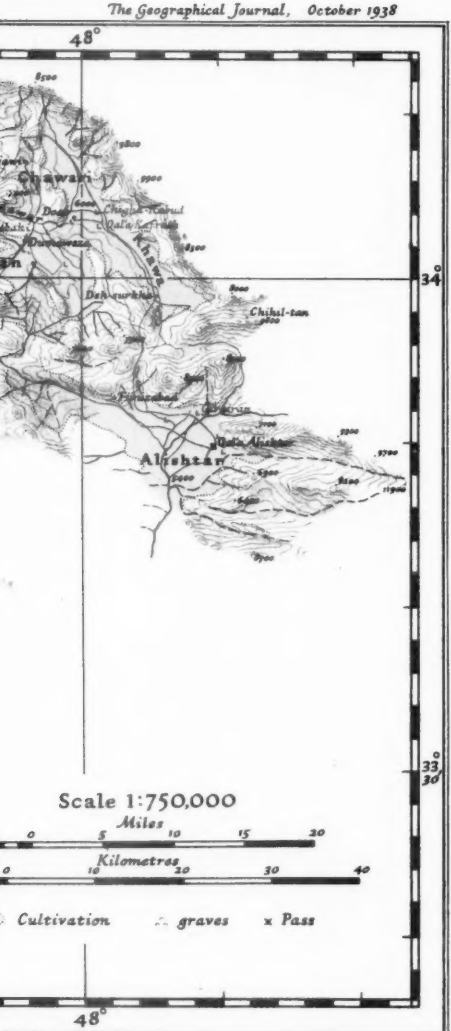

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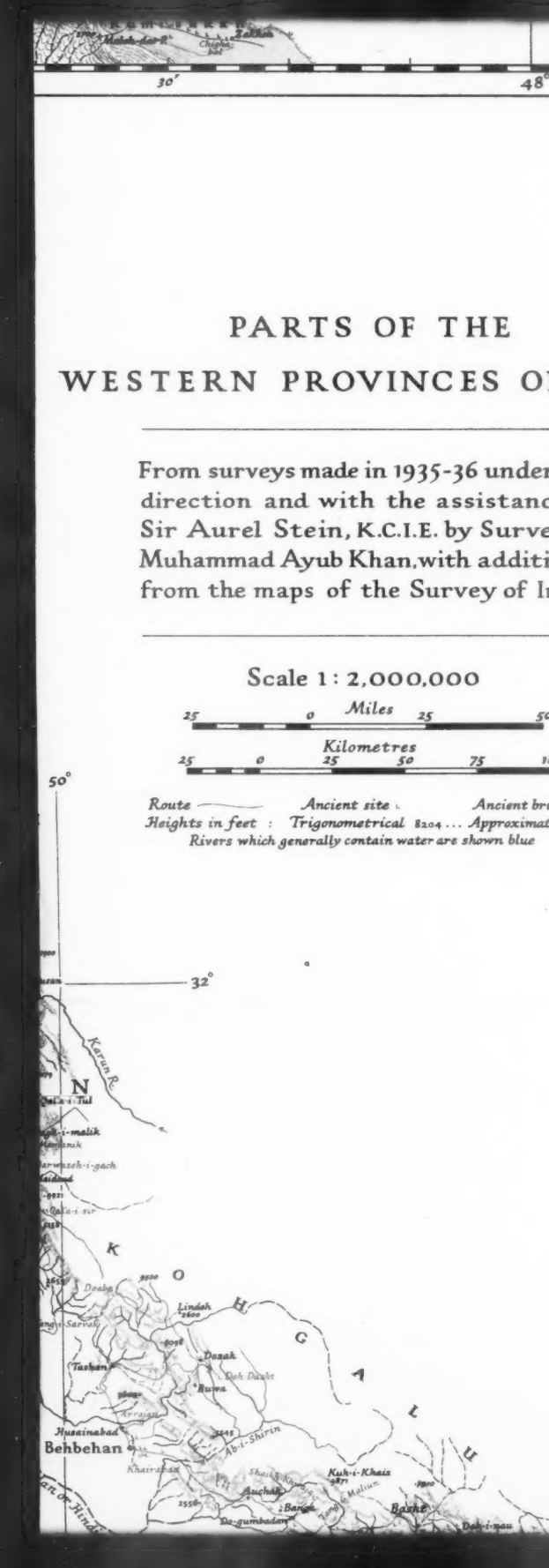
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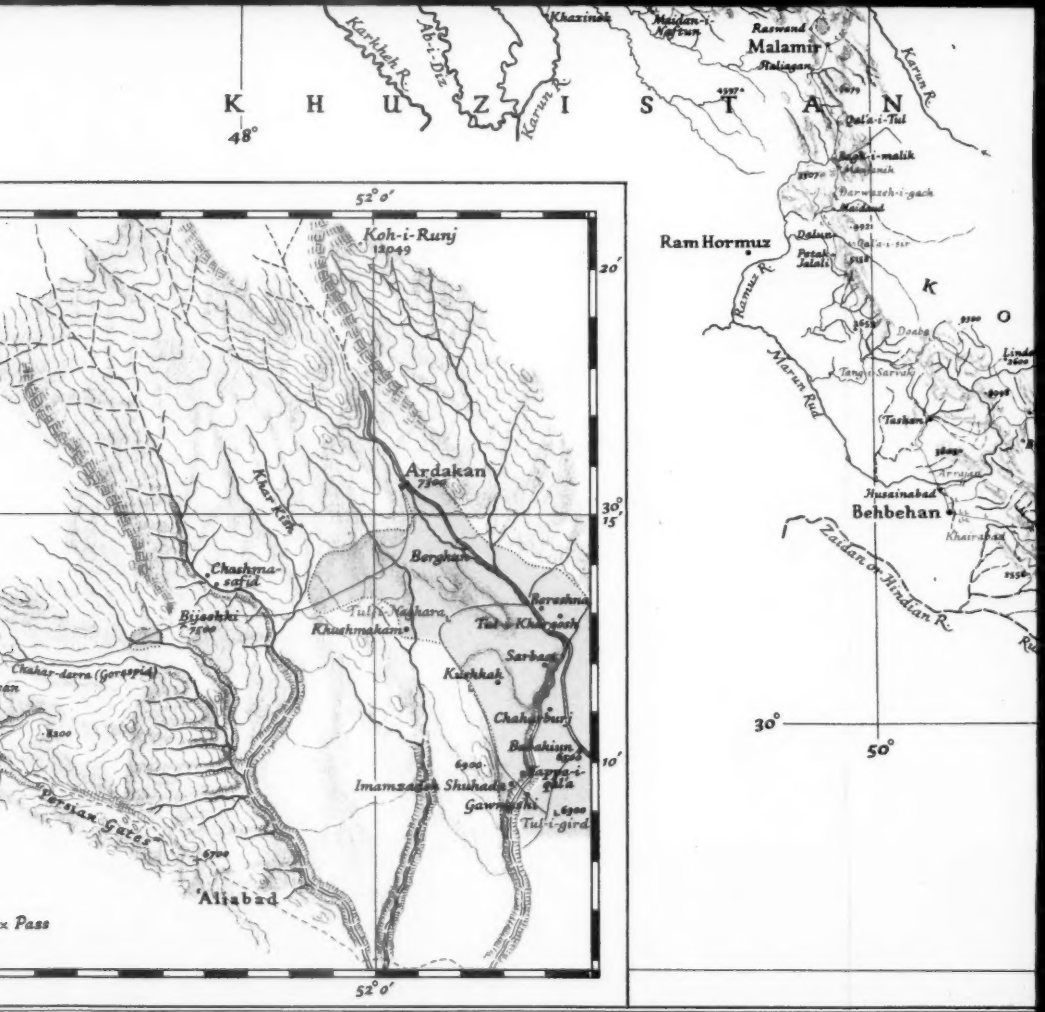

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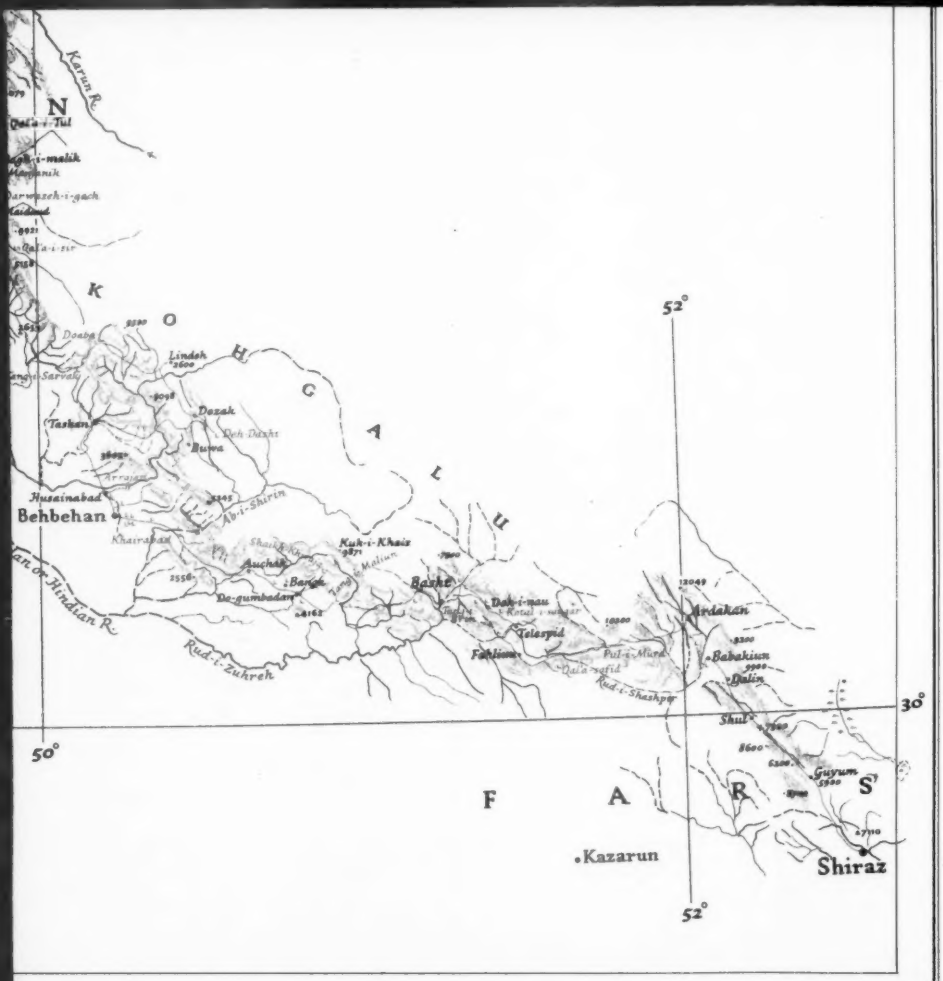

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